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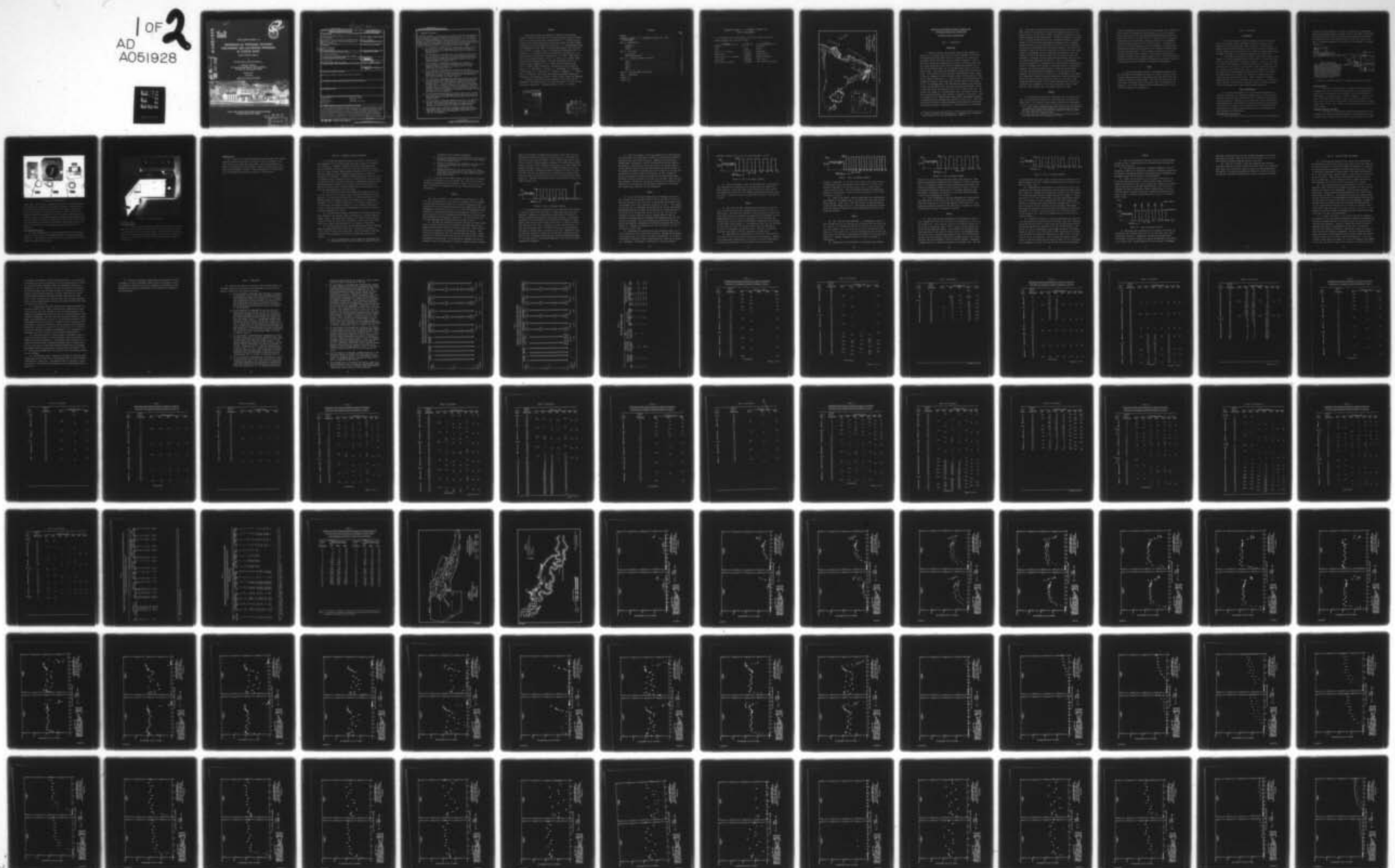

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DISPERSION OF PROPOSED EFFLUENT DISCHARGES AND SALTWATER INTRUSION IN COOPER RIVER

Hydraulic Model Investigation

by

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

An existing comprehensive physical model that correctly reproduced tides, tidal currents, and density currents throughout the Charleston Harbor was used to determine what quantity, if any, of effluents discharged into Cooper River would be transported from three proposed discharge points (located between miles 30 and 37 on Cooper River) to the mouth of the freshwater intake canal for the reservoir (located at mile 43) and subsequently through the intake canal into the reservoir proper. In addition to travel times of the effluents — over

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20. ABSTRACT (Continued).

to critical locations, it was desired to determine the maximum concentrations of the effluents in Cooper River and Back River Reservoir. It was desired to know the rates of increases of effluent concentrations at critical locations should the freshwater discharge from Pinopolis reduce to zero. It was also desired to know if there would be saltwater intrusion into Back River Reservoir during operation of the Schedule C and Schedule E hydrographs. Based on the results of the model tests, the following conclusions were reached:

a. For the Schedule C hydrograph and continuous dye release at Cooper River mile 37 (sta 37C), measurable concentrations reached the Back River Reservoir (sta BR1) within four tidal cycles after the release (Test 1).

b. For the Schedule C hydrograph and the dye released at Cooper River mile 37 (sta 37C) at the rate of 30 cfs during each ebb phase of the tide and 0 cfs during each flood phase, measurable dye concentrations reached the Back River Reservoir (sta BR1) within four tidal cycles after the release (Test 2).

c. For the Schedule C hydrograph and continuous dye release at Cooper River mile 33 (sta 33C), measurable dye concentrations reached the Back River Reservoir (sta BR1) within five tidal cycles after the release (Test 3).

d. For the Schedule C hydrograph and continuous dye released at Cooper River mile 33 (sta 33C) at the rate of 30 cfs during each ebb phase of the tide and 0 cfs during each flood phase, measurable dye concentrations reached the Back River Reservoir (sta BR1) within five tidal cycles after the release (Test 4).

e For the Schedule C hydrograph and continuous dye release at Cooper River mile 30 (sta 30C), measurable dye concentrations reached the Back River Reservoir (sta BR1) within 25 tidal cycles after the release (Test 5). During the period of zero flow (cycles 56-68), dye moved into the Back River Reservoir with maximum concentrations of about 0.09 to 0.13 percent of initial concentration. After resuming the Schedule C hydrograph, the dye was flushed from sta BR1 with about 0.02 to 0.05 percent still remaining at sta BR2, BR3, and BR4 when the test was terminated.

f. For the Schedule E hydrograph and continuous dye release at Cooper River mile 37 (sta 37C), measurable dye concentrations reached the Back River Reservoir (sta BR1) within three tidal cycles after the release (Test 6).

g. For the Schedule C hydrograph, maximum salinities in the Back River Reservoir varied from 15 ppm total salt at sta BR1 to 46 ppm at sta BR2. For the Schedule E hydrograph, the maximum salinities varied from 10 ppm at sta BR1 to 15 ppm at sta BR2 and BR3.

h. The upstream limit of intrusion (100 ppm) of ocean salt water (high-water slack, bottom) was approximately Cooper River mile 43 (sta 43C) for Schedule C and approximately Cooper River mile 41 (sta 41C) for Schedule E.

PREFACE

This report presents the results of dispersion and salinity studies requested by the State of South Carolina Water Resources Commission for the Cooper River Water Users Association. The study was performed in the existing Charleston Harbor model during the period August to November 1975 by the Hydraulics Laboratory, U. S. Army Engineer Waterways Experiment Station (WES), Vicksburg, Mississippi, under the direction of Mr. H. B. Simmons, Chief of the Hydraulics Laboratory; Mr. F. A. Herrmann, Jr., Assistant Chief of the Hydraulics Laboratory; Mr. R. A. Sager, Chief of the Estuaries Division; Mr. W. H. Bobb, former Chief of the Interior Channel Branch; and Mr. R. A. Boland, Jr., present Chief of the Interior Channel Branch. The study was conducted by Mr. M. J. Trawle, Project Manager; Mr. H. A. Benson, Project Engineer; and Mr. H. R. Smith, Senior Technician. Technical help was provided by Messrs. C. R. Herrington, J. Cessna, J. T. Cartwright, T. W. McGough, D. M. Stewart, E. S. Jefferson, M. S. Taylor, D. Marzette, J. S. Ashley, and H. P. Townsley. This report was prepared by Messrs. Benson and Boland with the assistance of Messrs. Smith, Trawle, Sager, and Herrmann.

Directors of WES during the performance of this study and the preparation and publication of this report were COL G. H. Hilt, CE, and COL John L. Cannon, CE. Technical Director was Mr. F. R. Brown.

CONTENTS

CONVERSION FACTORS, U. S. CUSTOMARY TO METRIC (SI) UNITS OF MEASUREMENT

U. S. customary units of measurement used in this report can be converted to metric (SI) units as follows:

Multiply	By	To Obtain
inches	25.4	millimetres
feet	0.3048	metres
miles (U. S. statute)	1.609344	kilometres
square feet	0.09290304	square metres
square miles (U. S. statute)	2.589988	square kilometres
cubic yards	0.7645549	cubic metres
cubic feet per second	0.02831685	cubic metres per second

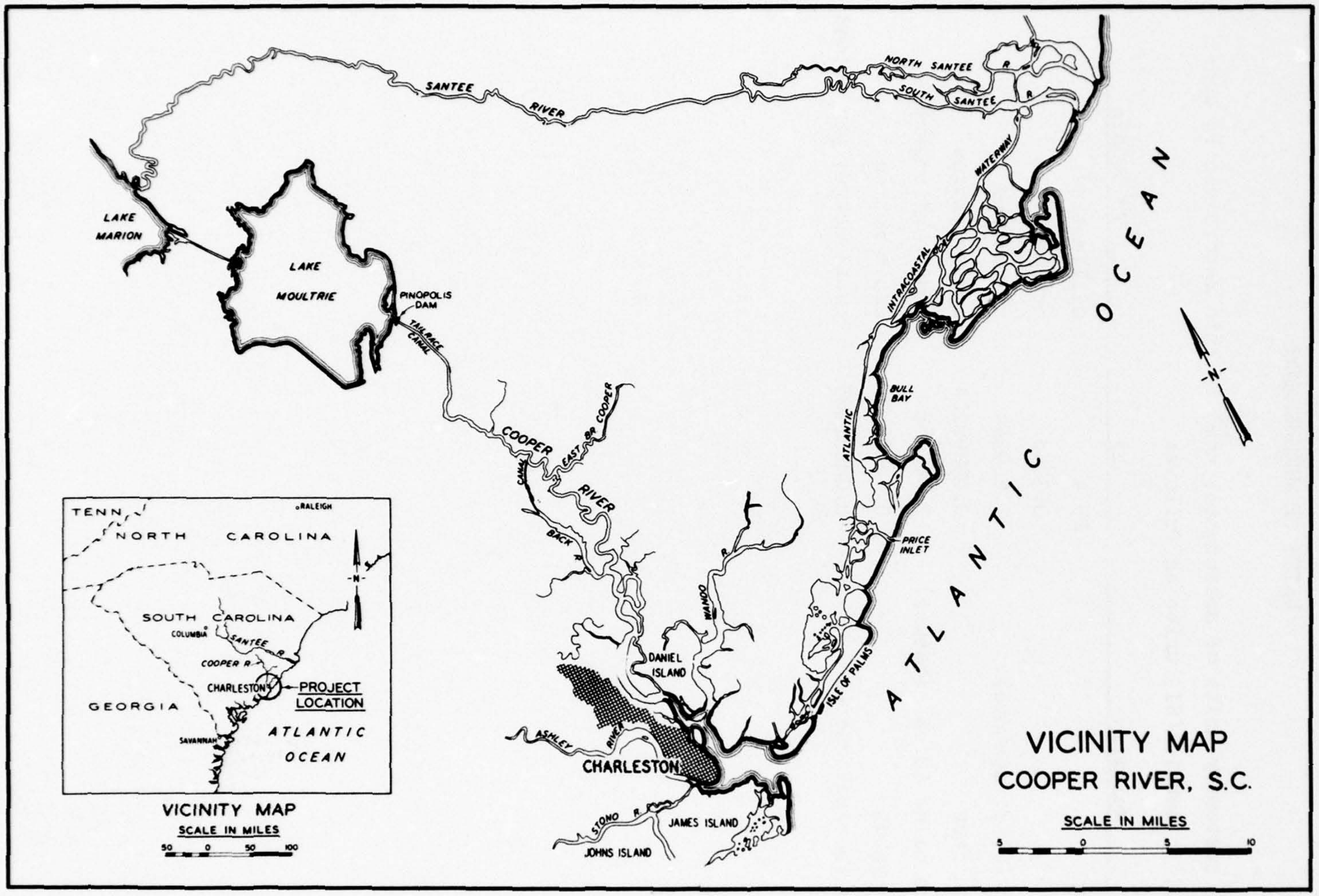

Figure 1. Location map

DISPERSION OF PROPOSED EFFLUENT DISCHARGES AND SALTWATER INTRUSION IN COOPER RIVER

Hydraulic Model Investigation

PART I: INTRODUCTION

Background

1. Charleston Harbor, an important South Carolina seaport, is located on the Atlantic coast about 110 miles* southwest of the North Carolina-South Carolina State line and is formed by the junction of the Ashley, Wando, and Cooper Rivers as shown in Figure 1. Prior to 1940, the estuary had a drainage area of about 1,400 square miles, and the average freshwater inflow from all tributaries was about 415 cfs (261 cfs from Ashley River, 82 cfs from Wando River, and 72 cfs from Cooper River). The estuary was homogeneous, being almost entirely salt water. Construction of the Santee-Cooper Hydroelectric Project, begun in 1940 and completed in 1942, included a dam in the West Branch of the Cooper River at Pinopolis, S. C., and diversion of the Santee River flow through the Pinopolis power plant into the West Branch of the Cooper River. The drainage area of the Charleston Estuary was thus increased to about 16,000 square miles, and the average annual freshwater inflow of the Cooper River was increased from 72 cfs to about 15,600 cfs. The estuary was changed to a partially mixed type, and density currents became a controlling factor with respect to shoaling in the harbor. Prior to completion of the Santee-Cooper power project, maintenance dredging in Charleston Harbor averaged about 180,000 cu yd per year. Since completion of the project, annual maintenance requirements in the navigation channels steadily increased up to 10,000,000 cu yd at the present

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* A table of factors for converting U. S. customary units of measurement to metric (SI) units is presented on page 3.

time. The results of previous studies* indicated that rediversion of a major portion of the Santee River flow from Cooper River back to the Santee River is the best way to obtain a substantial reduction in maintenance dredging in Charleston Harbor. However, continuation of as much flow as possible through Pinopolis was considered desirable to minimize change to the Cooper River and harbor environment and to accommodate downstream needs of Bushy Park Reservoir at mile 43 and the Jefferies Stream Electric Generating Plant just below Pinopolis. The Bushy Park Reservoir, which fills from the Cooper River at mile 43, has been established as a freshwater source for municipal and industrial uses; and salinity intrusion (80 ppm total salt) into the reservoir cannot be tolerated. Discharges from the municipal and industrial areas are into the Cooper River downstream from mile 43. The U. S. Army Engineer District, Charleston, is developing a monitoring system to determine the effect of freshwater flow changes in the Cooper River on the hydraulic, salinity, and shoaling characteristics in Charleston Harbor during both pre- and post-rediversion conditions. The optimum inflow at Pinopolis to best satisfy all interests will be determined. The existing Cooper River Federal navigation channel and the portion maintained by the Navy are maintained at project depths of -35 ft mlw.** The Federal navigation channel and the portion maintained by the Navy are scheduled to be deepened to -40 ft mlw in the Cooper River to about mile 23. This condition was in the model during this study.

Purpose

2. The Bushy Park industrial development site is bounded on the west by the Back River Reservoir for fresh water and on the east by Cooper River. The industrial water supply scheme for the development

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* U. S. Army Engineer Waterways Experiment Station, CE, "Investigation for Reduction of Maintenance Dredging in Charleston Harbor, South Carolina; Summary Report of Model Investigation," Technical Report No. 2-444, Apr 1957, Vicksburg, Miss.

** In this report, mlw refers to mean low water for the Custom House tide gage located on the Charleston waterfront.

involves withdrawals from the reservoir and discharges into Cooper River. It was desired to determine in what quantity, if any, the effluents would be transported from three proposed discharge points (located between miles 30 and 37 on Cooper River) to the mouth of the freshwater intake canal for the reservoir (located at mile 43) and subsequently through the intake canal into the reservoir proper. In addition to travel times of the effluents to critical locations, it was desired to determine the maximum concentrations of the effluents in Cooper River and Back River Reservoir. It was desired to know the rates of increases of effluent concentrations at critical locations should the freshwater discharge from Pinopolis reduce to zero. It was also desired to know if there would be saltwater intrusion into Back River Reservoir during operation of the Schedule C and Schedule E hydrographs.

Scope

3. The testing program consisted of measuring salinities and dye concentrations throughout the model for various locations of dye release simulating wastewater discharges from Bushy Park and for two different freshwater inflow schemes. The first five tests were conducted with an average weekly flow rate of 3000 cfs (Schedule C) at Pinopolis. Test 6 was conducted with an average weekly flow rate of 3500 cfs (Schedule E) at Pinopolis.

PART II: THE MODEL

Description

4. The Charleston Harbor model reproduced the entire tidal portions of the Ashley, Cooper, and Wando Rivers and a portion of the Atlantic Ocean within the limits shown in Plate 1. The Ashley and Wando Rivers and the East Branch of the Cooper River were reproduced to correct lengths and cross sections but, in order to conserve space, were realigned to conform to the general alignment of the Cooper River.

5. The model was constructed to linear scale ratios, model to prototype, of 1:2,000 horizontally and 1:100 vertically. These scale ratios fixed the following model-to-prototype relations: slope 20:1, velocity 1:10, time 1:200, discharge 1:2,000,000, and volume 1:400,000,000. The salinity scale ratio was 1:1, and the model ocean supply was maintained at a salinity of 30,000 ppm total salts. One prototype tidal cycle of 12 hr and 25 min was reproduced in the model in 3.725 min. The model was approximately 137 ft long, 46 ft wide at the widest point, and covered an area of about 3,600 sq ft. Depths of water in the model range from about 1/2 in. in the marsh areas to about 5 in. in the navigation channel. The model was constructed within a shelter to protect it from the weather and to permit uninterrupted operation.

Model Appurtenances

6. The model was equipped with the necessary appurtenances to reproduce and measure all pertinent phenomena such as tidal elevations, saltwater concentrations, current velocities, freshwater inflows, and dye concentrations. Apparatus used in connection with the reproduction and measurement of these phenomena included an automatic tide generator and recorder, tide gages, current velocity meters, freshwater inflow measuring devices, skimming and measuring weirs, and fluorometers for dye concentration determinations.

Tide generator and recorder

7. The reproduction of tidal action in the model was accomplished

by means of a tide generator, located in the model ocean, which maintained a differential between a pumped inflow of salt water to the model and a gravity return flow to the supply sump as required to reproduce all characteristics of the prototype tides at the ocean control tide gage. A schematic drawing of the operation of this system is presented in Figure 2.

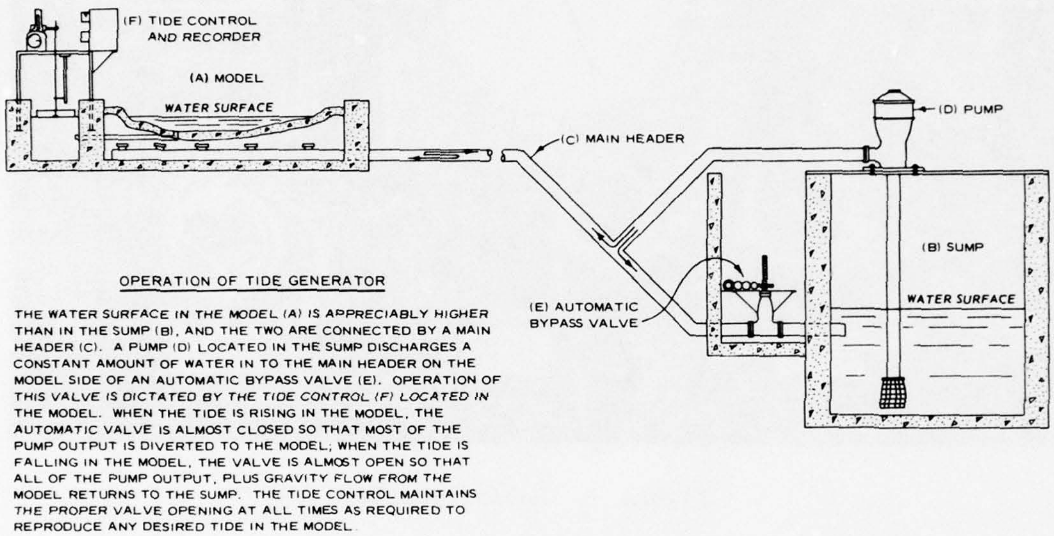


Figure 2. Schematic diagram of a typical tide generating system

Salinity meters

8. All salinity concentrations of samples taken from the model throughout the various tests were determined by use of salinity meters consisting of conductivity cells especially built and calibrated for this purpose. The salinity meter is shown in Figure 3. One cell was used for salinities below about 1.0 ppt; a second cell covered the range from 1.0 to about 5.0 ppt; while a third cell was used for values greater than 5.0 ppt. The accuracy of the salinity meter was ±2 percent of full range.

Chemical titration equipment

9. This method of determining salinity concentrations was used primarily for periodic calibration checks of the salinity meters, and to ensure that a constant source salinity was maintained in the ocean

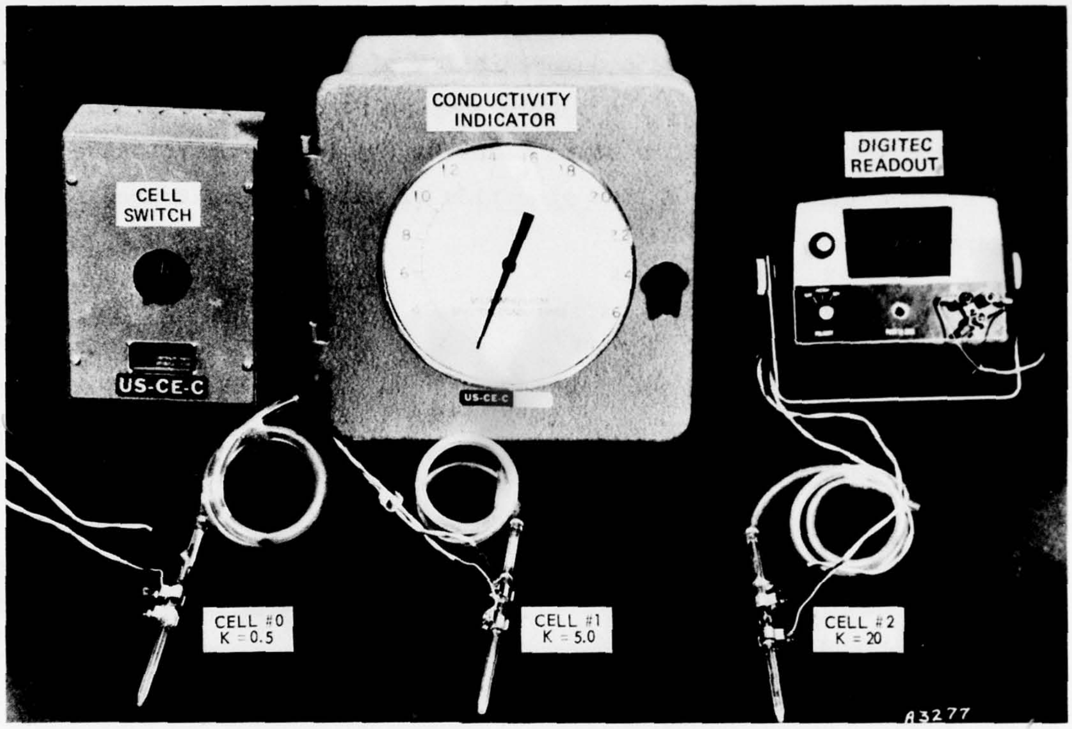


Figure 3. Salinity meter

supply sump. The titration equipment consisted of a graduated burette for measuring the volume of silver nitrate required to precipitate the salt, pipettes for measuring the volume of each sample, sample jars in which to perform the titration, a supply of silver nitrate, and a quantity of potassium chromate for use as an end-point indicator in the titration process. The method consisted of adding a known concentration of silver nitrate solution to a known volume of the model salinity sample; the amount of silver nitrate required to precipitate the salt contained in the sample was then converted to salinity in parts per thousand.

Dye concentration meter

10. Dye concentrations of samples taken from the model throughout the various tests were determined by means of a Turner fluorometer (Figure 4). The accuracy of the fluorometer is about ± 3 percent for the range of concentrations measured.

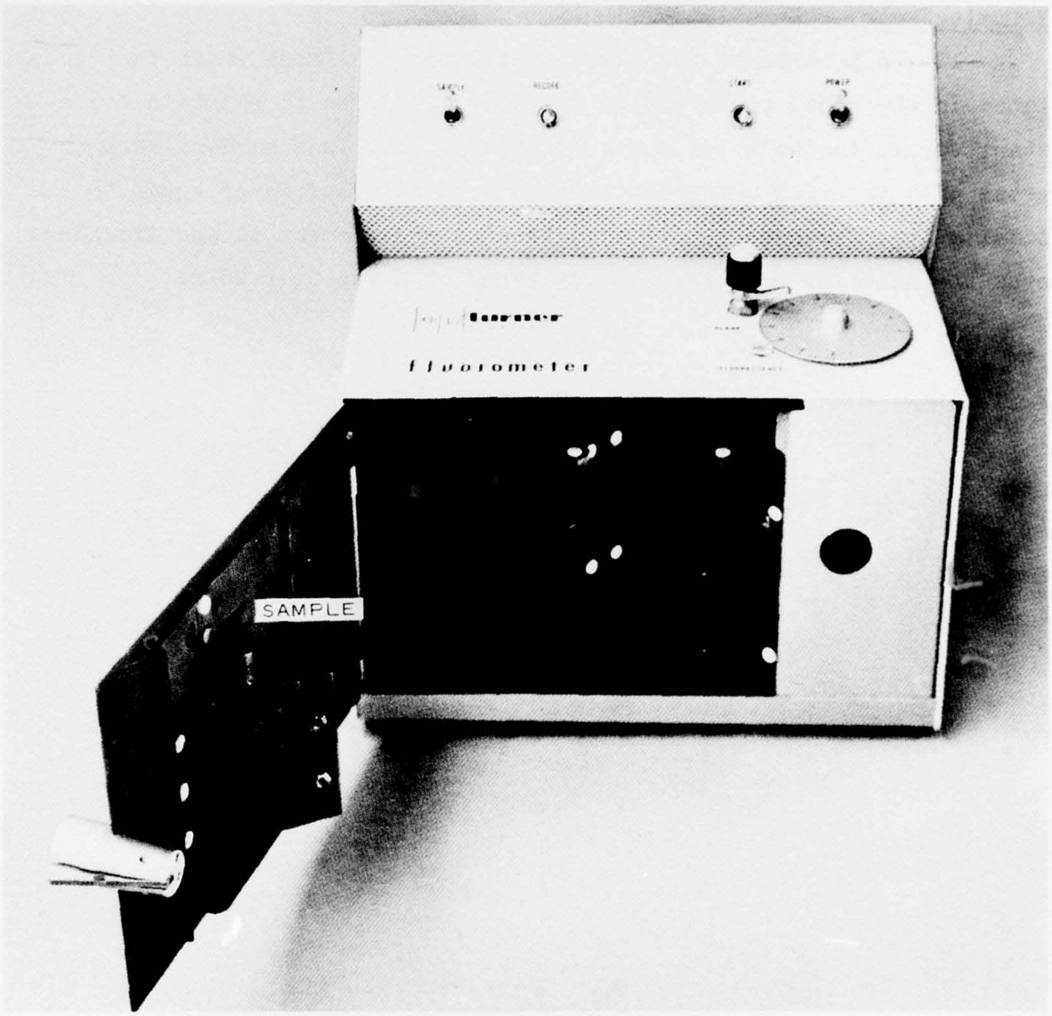


Figure 4. Turner fluorometer

Freshwater inflow
measuring devices

11. All rivers with freshwater inflows were equipped with a constant head tank and either Brooks rotometers or Van Leer weirs for precise measurements of the respective flows. The Cooper River control at Pinopolis was equipped with a quick-opening valve to make it possible to simulate the flow changes dictated by the power-generating schedule being tested.

Skimming weir

12. A portion of the mixed salt water and fresh water that accumulated in the model ocean had to be wasted in order to maintain a constant volume in the model and sump system. This was accomplished by means of a skimming weir that removed a quantity of water equal to the total of the freshwater inflows. Precise measurement of the discharge over the skimming weir was made by means of a Van Leer weir.

PART III: DISPERSION TESTS AND RESULTS

13. The testing program consisted of six tests. The first five were conducted with an average weekly flow rate of 3,000 cfs (Schedule C) at Pinopolis. Schedule C simulated a possible power-generating station operation at Pinopolis with zero flow for 3 days and 5,250-cfs flow for 4 days, giving a weekly average discharge of 3,000 cfs (Table 1). Test 6 was conducted with an average weekly flow rate of 3,500 cfs (Schedule E) at Pinopolis. Schedule E simulated 69 hr of zero flow, 3 hr of 28,500-cfs flow, followed by 4 days of 5,250-cfs flow, giving an average weekly flow rate of 3,500 cfs (Table 2). Transparent overlays of the operating schedules (Figures 5-10) for each test are provided in the pocket on the back cover to readily compare the dye concentration results and the freshwater inflow fluctuations.

14. The Cooper River navigation channel was deepened from 35 ft to 40 ft to mile 23 in the model, since the proposed deepening has been approved. All tests were conducted with a continuous reproduction of an average spring tide having an ocean tide range of 5.4 ft (high-water elevation = 5.8 ft; low-water elevation = 0.4 ft) and a range of 6.0 ft at Custom House (high-water elevation = 6.3 ft; low-water elevation = 0.3 ft). The ocean supply sump was maintained at a constant salinity of 30,000 ppm throughout all tests.

15. Salinity and dye samples were taken in the Cooper River, Back River Reservoir, and entrance canal to Back River at locations shown in Plates 1 and 2. The samples were taken at the times of local high- and low-water slacks at surface and bottom depths at the tidal cycles indicated on the salinity and dye plots for the duration of each test.

16. All dye dispersion data were processed and plotted by computer using a standard WES program, the results of which are presented in Plates 3-115 for Tests 1-6, respectively. The data analysis steps that resulted in the time/percent of initial concentration plots were as follows:

- a. The dye concentration of each sample was determined from Pontacyl Brilliant Pink dye calibration equations for the

fluorometer used in sample measurement.

b. The dye concentrations were corrected by subtracting the background concentration (dye detected at each location prior to starting a test).

c. The dye concentrations were divided by the initial concentration to determine the percent of initial concentration.

d. Graphs were plotted of the log of percent of initial concentration as a function of time, expressed in tidal cycles after initiation of the dye release, for each observation station.

17. To include all dye samples taken, values below 0.01 percent (10 ppb) were plotted on the 0.01 percent line. For all tests, the initial dye concentration was 100,000 ppb. Values of 0.01, 0.10, 1.00, and 10.00 percent are equivalent to 10, 100, 1,000, and 10,000 ppb, respectively.

Test 1

18. Test 1 involved: (a) a continuous dye discharge at a rate of 15 cfs in Cooper River at mile 37 with a companion 15-cfs withdrawal from Back River Reservoir wasted; (b) a 750-cfs withdrawal from the reservoir at the South Carolina Electric and Gas (SCE&G) plant (BR1) and discharged in Cooper River at mile 33; (c) a 185-cfs withdrawal from the reservoir at the Verona plant (BR2) and discharged in Cooper River at mile 29; and (d) a 200-cfs withdrawal from the reservoir in Foster Creek and discharged off the battery at Charleston. The dye injection location and withdrawal and discharge points are shown in Plate 2.

19. The model was operated to salinity stability (69 tidal cycles) using a constant 3,000-cfs flow at Pinopolis and simulating all withdrawals and discharges except the 15-cfs dye discharge. After salinity stability was achieved, the Schedule C hydrograph was started. After 1 week of the hydrograph, the 15-cfs dye discharge was started. About 3 weeks after the dye injection was started, dye stability was achieved throughout the problem area. It was desired to determine the rates of increases of waste concentrations at critical locations should a disaster

reduce the freshwater discharge from Pinopolis to zero until the next dye-salinity plateau was reached in the problem area. Therefore, the flow rate at Pinopolis was reduced to zero 4 weeks after the dye injection was started. Model operation continued for an additional 19 tidal cycles, at which time the salinity concentration at sta BR1 (SCE&G) had reached 1,340 ppm. Then, in order to determine flushing time in the problem area with a freshwater release at Pinopolis of 28,500 cfs, the Pinopolis flow rate was changed from 0 to 28,500 cfs (75 tidal cycles after dye release started) and continued for 12 additional tidal cycles (Figure 5). Time-dye concentration plots for each station of Test 1 are shown in Plates 3-19.

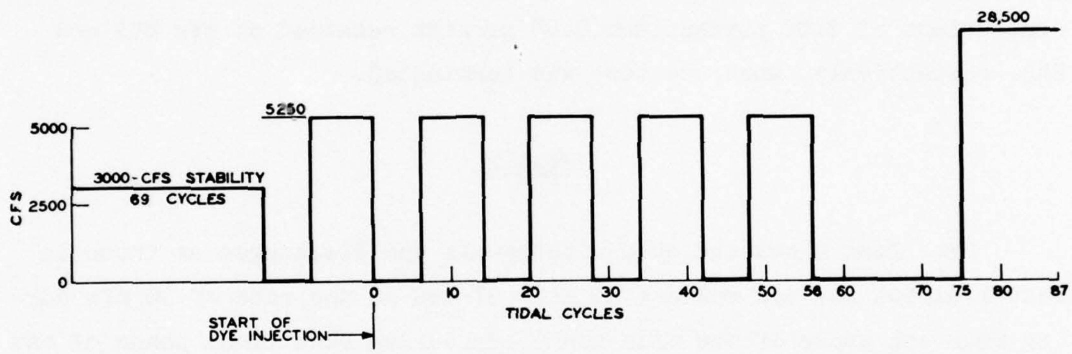


Figure 5. Test 1 discharge schedule

20. Measurable dye concentrations were indicated at the entrance to Back River Canal (sta 43C, Plate 14) within one tidal cycle after injection. Maximum dye concentrations reached about 0.5 percent of initial concentration after dye stability was obtained. A noticeable fluctuation of dye concentrations was caused by the Schedule C hydrograph as the flow went from 3 days of zero flow to 4 days of 5,250-cfs flow and back to zero flow. During the 19 cycles (cycles 56-75) of zero flow following 4 days of 5,250-cfs flow, the dye concentrations increased to slightly above 1.0 percent at sta 43C. Immediately after the flow was increased to 28,500 cfs, the dye was flushed downstream from sta 43C. Measurable concentrations of dye were detected upstream in the Cooper River to sta 50C and downstream to sta 00C during normal operations of Schedule C.

21. Plate 17 and Table 3 show that significant dye concentrations were observed in the intake canal (sta BRC) of the Back River Reservoir within one tidal cycle after injection. Maximum dye concentrations reached about 0.9 percent of initial concentration after dye stability was obtained. After three or four tidal cycles, the dye had reached sta BR1 and BR2 located in the Back River Reservoir (Plates 18 and 19). The maximum concentrations varied from about 0.4 percent of initial concentration at sta BR1 to about 0.6 percent at sta BR2. During the period of sustained zero flow (cycles 56-75), dye concentrations were increased to about 1.0 percent at sta BRC, BR1, and BR2. After the flow was increased to 28,500 cfs, the dye was flushed from sta BRC while concentrations of 0.02 percent and 0.08 percent remained at sta BR1 and BR2, respectively, when the test was terminated.

Test 2

22. Test 2 had the same withdrawals and discharges as those in Test 1 except the dye release at mile 37 was at the rate of 30 cfs during each ebb phase of the tide and 0 cfs during each flood phase of the tide instead of the 15-cfs continuous release as in Test 1. The purpose of this test was to investigate the possibility of the dye being flushed downstream during the ebb phase of the tide and not moving upstream as far as sta 43C if released only during the ebb tide. The model was operated to salinity stability using a constant 3000-cfs flow at Pinopolis and simulating all withdrawals and discharges except for the 30-cfs dye discharge. The dye discharge was started after the first week of the Schedule C hydrograph and continued through 60 tidal cycles (Figure 6). Time-dye concentration plots for each station for Test 2 are shown in Plates 20-36.

23. Measurable dye concentrations were indicated (Plate 31) at sta 43C within two tidal cycles after injection. Maximum dye concentrations reached about 0.5 percent of initial concentration. As in Test 1, a noticeable fluctuation of dye concentrations was caused by the Schedule C hydrograph. Measurable concentrations of dye were detected

upstream in Cooper River to sta 50C and downstream to sta 00C.

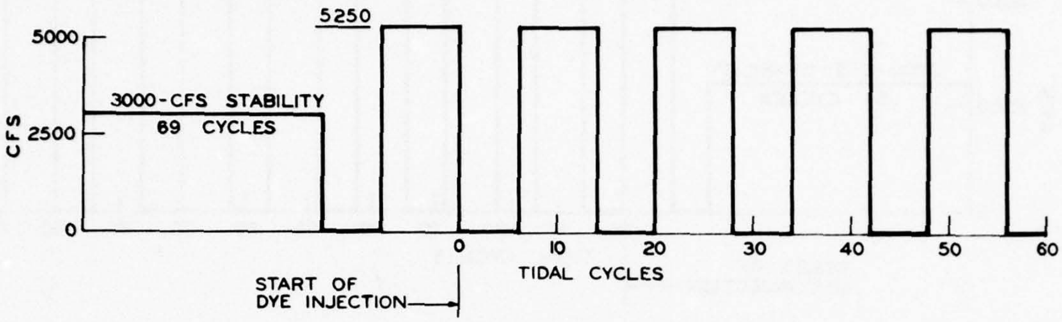


Figure 6. Test 2 discharge schedule

24. Plate 34 and Table 3 show that measurable dye concentrations were observed in the intake canal at sta BRC within one tidal cycle after injection. After five tidal cycles (Plates 35 and 36), the dye had reached sta BR1 and BR2. The maximum concentration observed at BR1 was about 0.5 percent of initial concentration and about 0.3 percent at sta BR2.

Test 3

25. Test 3 had the same withdrawals and discharges as those in Test 1 except that the 15-cfs continuous dye release was at mile 33 in Cooper River. The model was operated to salinity stability using a constant 3000-cfs flow at Pinopolis and simulating all withdrawals and discharges except for the 15-cfs dye discharge. The dye discharge was started after the first week of the Schedule C hydrograph and continued for 100 tidal cycles (Figure 7). The duration of this test was increased to 100 cycles to ensure that stability had really been achieved by 60 cycles, as assumed in the previous tests. Time-dye concentration plots for each station for Test 3 are shown in Plates 37-55.

26. Measurable dye concentrations (0.06 percent) were detected (Plate 48) at sta 43C within two tidal cycles after injection. Maximum dye concentrations reached about 0.2 percent of initial concentration. A noticeable fluctuation of dye concentrations was caused by the

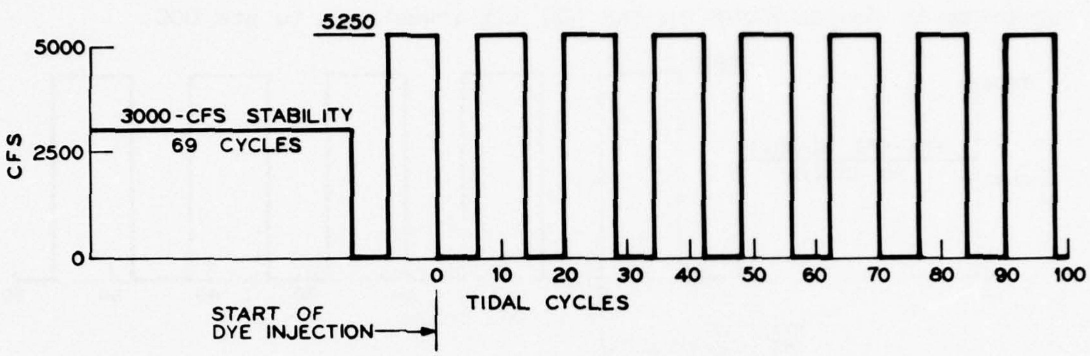


Figure 7. Test 3 discharge schedule

Schedule C hydrograph. At the end of the 3 days of zero flow, the dye concentrations during the high-water slack portion of the tidal cycle reached the maximum of 0.2 percent and fell off to 0 percent after 4 days of 5250-cfs flow. This was repeated throughout the hydrograph. Measurable concentrations of dye were detected upstream to sta 45C and downstream to sta 00C.

27. Plate 51 and Table 3 show that measurable dye concentrations were observed in the intake canal at sta BRC within three tidal cycles after injection. After five or six tidal cycles, the dye had reached sta BR1 and BR2 (Plates 52 and 53). The maximum concentration observed at BR1 was about 0.09 percent of initial concentration and about 0.05 percent at sta BR2.

Test 4

28. Test 4 had the same withdrawals and discharges as those in Test 1 except that the dye discharge was at Cooper River mile 33 and was at a rate of 30 cfs during the ebb phase of the tide and 0 cfs during each flood phase of the tide instead of the 15-cfs continuous dye discharge as in the previous test. The dye discharge was started after the first week of the Schedule C hydrograph and continued for 60 tidal cycles (Figure 8). Time-dye concentration plots for Test 4 are shown in Plates 56-72.

29. Measurable dye concentrations (0.03 percent) were detected

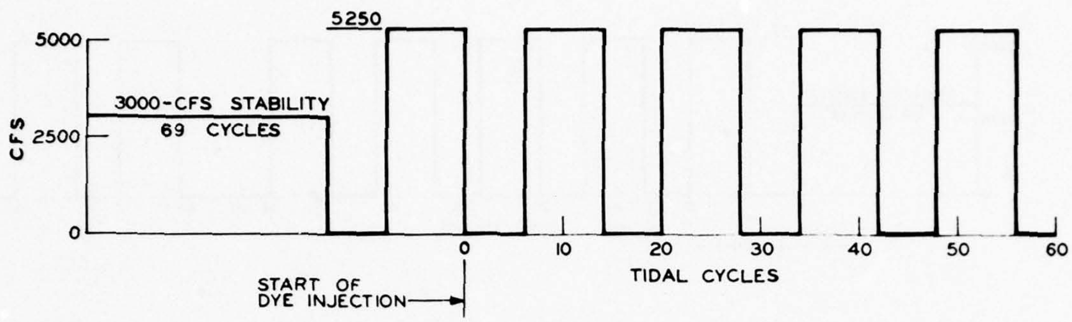


Figure 8. Test 4 discharge schedule

(Plate 67) at sta 43C within four tidal cycles after injection. Maximum dye concentrations reached about 0.15 percent of initial concentration. A noticeable fluctuation of dye concentrations was caused by the Schedule C hydrograph, varying from zero percent of initial concentration during the 5250-cfs flow period to 0.15 percent during the zero flow period. Measurable concentrations of dye were detected upstream to sta 45C and downstream to sta 00C.

30. Plate 70 and Table 3 show that measurable dye concentrations were observed at sta BRC within four tidal cycles after injection. After five tidal cycles, the dye had reached sta BR1 (Plate 71). The maximum concentration observed at BR1 was about 0.11 percent of initial concentration and about 0.08 percent at sta BR2.

Test 5

31. Test 5 had the same withdrawals and discharges as those in Test 1 except that the 15-cfs continuous dye discharge was at mile 30 in the Cooper River. After salinity stability was achieved, simulation of the Schedule C hydrograph began. After 1 week of the hydrograph, the 15-cfs dye discharge was started. At the request of the sponsors who were observing the test, after 56 tidal cycles of the hydrograph simulation, the flow at Pinopolis was reduced to zero for 12 tidal cycles, by which time the salinity at sta BR1 had reached 410 ppm. The flow at Pinopolis was then increased to 5250 cfs and the Schedule C hydrograph resumed (Figure 9) to determine flushing in the problem area. The test

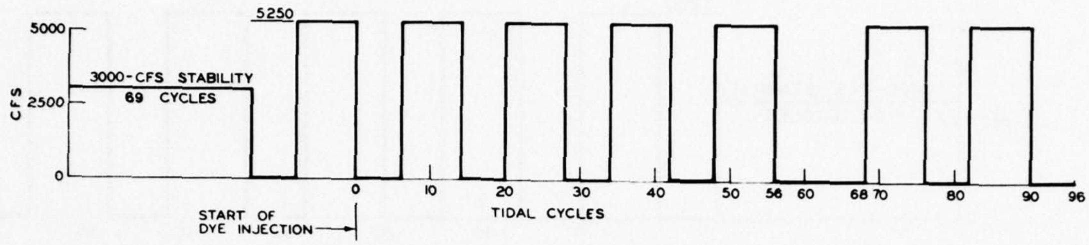


Figure 9. Test 5 discharge schedule

was concluded after 96 tidal cycles, by which time the salinity at sta BR1 had dropped to 20 ppm. Time-dye concentration plots for Test 5 are shown in Plates 73-92.

32. Measurable dye concentrations (0.03 percent of initial concentration) were detected (Plate 85) at sta 43C within six tidal cycles after injection. Maximum dye concentrations reached about 0.07 percent of initial concentration during normal operation of Schedule C. During the period of zero flow (cycles 56-68), the peak concentration reached about 0.25 percent of initial concentration, and after resuming the Schedule C hydrograph, the peak concentration dropped back to 0.07 percent. During the initial operation with the Schedule C hydrograph, measurable concentrations of dye were detected upstream to sta 43C and downstream to sta 00C. During the period of no flow (cycles 56-68), the dye moved up to sta 45C but was flushed back to sta 43C after resuming Schedule C.

33. Plates 88-92 and Table 3 show that measurable dye concentrations were observed at sta BRC within five tidal cycles after injection (Plate 88) and after about 25 tidal cycles the dye had reached sta BR1. The maximum concentration observed at sta BR1 and BR2 was about 0.02 percent of initial concentration during normal operation of Schedule C. During the period of zero flow (cycles 56-68), dye moved into the Back River Reservoir with maximum concentrations of about 0.09 to 0.13 percent of initial concentration. After resuming the Schedule C hydrograph, the dye was flushed from sta BR1 with about 0.02 to 0.05 percent still remaining at sta BR2, BR3, and BR4 when the test was terminated.

Test 6

34. Test 6 was operated for the same withdrawals and discharges as those in Test 1 including the 15-cfs continuous dye discharge into Cooper River at mile 37.

35. The model was operated at a constant freshwater flow from Pinopolis of 3500 cfs for 69 cycles, followed by continuous operation of the Schedule E hydrograph (Table 2) and simulating all withdrawals and discharges except the continuous 15-cfs dye release.

36. After 1 weeks operation of the Schedule E hydrograph, the 15-cfs dye release was started. After 56 tidal cycles, the flow at Pinopolis was reduced to zero for 17 tidal cycles (Figure 10), by which time the salinity at sta BR1 had reached 680 ppm. This was done to determine the rates of increases of waste concentrations at critical locations should a disaster reduce the freshwater discharge from Pinopolis to zero. Time-dye concentration plots for Test 6 are shown in Plates 93-115.

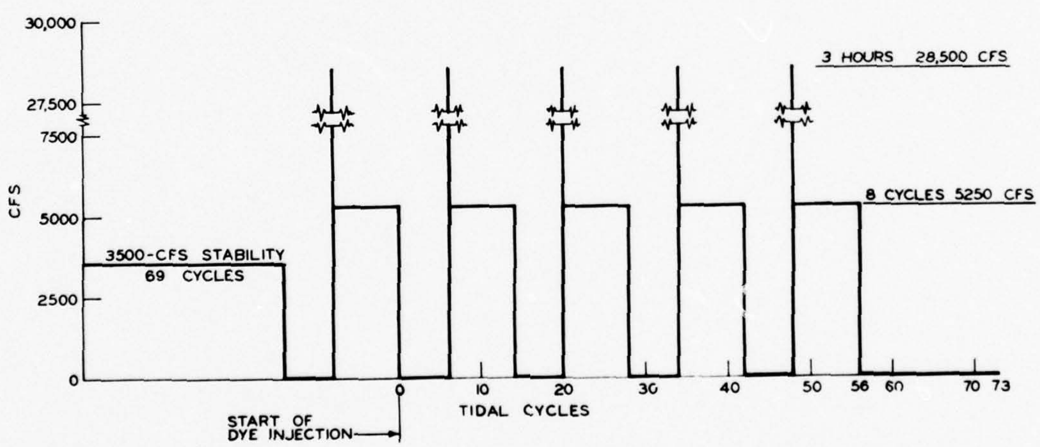


Figure 10. Test 6 discharge schedule

37. Measurable dye concentrations (0.06 percent of initial concentration) were detected (Plate 107) at sta 43C within three tidal cycles after injection. Maximum dye concentrations reached about 0.6 percent of initial concentration during the high-water slack period of the tidal cycle. During operation with the Schedule E hydrograph,

measurable concentrations of dye were detected upstream to sta 45C and downstream to sta 00C. There was no definite indication that the dye moved farther upstream during the period of zero flow.

38. Plate 111 and Table 3 show that measurable dye concentrations were observed at sta BRC within three tidal cycles after injection. After about four tidal cycles (Plates 112 and 113) dye had reached sta BR1 and BR2. The maximum concentration observed at sta BR1 was about 0.25 percent of initial concentration and about 0.2 percent at sta BR2.

PART IV: SALINITY TESTS AND RESULTS

39. During each dye dispersion test (Tests 1-6), salinity data were obtained at the Tee (mile 39.5) and sta 43C in the Cooper River and at various stations in the Back River Canal and Reservoir. In addition, the testing program was expanded to include three repeat tests in order to obtain more comprehensive salinity data in the Back River Reservoir and to check the previous salinity results. These tests are referred to as 1R, 2R, and 6R. Tests 1R and 2R were conducted exactly as Tests 1 and 2, respectively. Test 6R duplicated Test 6, except that the test was terminated after 6 cycles of zero flow instead of 17 cycles.

40. After salinity stability was obtained for Schedules C and E, high-water slack bottom salinity samples were taken after each zero and 5250-cfs flow period of the hydrograph. These data are included in Tables 4-12. Average maximum and minimum salinities for each location are presented in Table 13. The maximum salinities were obtained after the zero flow period of the hydrograph while the minimum salinities were obtained after the 5250-cfs flow period of the hydrograph. Averages of the data taken during the various tests indicate that maximum salinities in the Back River Reservoir for the Schedule C Pinopolis release varied from 15 ppm total salt at sta BR1 to 46 ppm at sta BR2. For the Schedule E Pinopolis release, the maximum salinities varied from 10 ppm at sta BR1 to 15 ppm at sta BR2 and BR3.

41. At the end of Tests 1, 1R, 5, and 6, the flow at Pinopolis was reduced to zero, and salinity samples were obtained to determine the effects of prolonged periods of zero flow on salinity concentrations in the Back River Reservoir. Results of these tests, shown in Table 14, indicate that salinity concentrations of about 70 to 120 ppm were detected in the Back River Reservoir (BR1 and BR2) after six cycles of zero flow with the Schedule C hydrograph. With the Schedule E hydrograph, salinities of this magnitude did not reach the Back River Reservoir until after about 11 cycles of zero flow (Table 14). At the end of Test 3 (after cycle 100, Figure 7), the flow at Pinopolis was reduced to 1135 cfs, and salinity samples were obtained to determine the effects

on salinity concentrations in the Back River Reservoir. This was done to determine the rates of increases of salinity concentrations at critical locations should a disaster reduce the freshwater discharge from Pinopolis to 1135 cfs. Results of this test along with the results of the zero flow after Test 1R, shown in Table 15, indicate that with the 1135-cfs continuous flow condition, salinity concentrations of about 90 ppm reached the Back River Reservoir (BR2) after about 18 tidal cycles. For a comparable test (1R) with zero flow, salinity concentrations of about 90 ppm reached the Back River Reservoir (BR2) after about 12 tidal cycles (Table 15).

42. Time-history plots were developed for selected stations from the data in Tables 4-12. Plates 116-119 present comparisons of salinities at sta 43, BRC, BR1, and BR2 for Test 3 during operation of the Schedule C hydrograph with salinities for Test 6 during operation of the Schedule E hydrograph. The plots show that during the Schedule C hydrograph, the salinity moved in and out of the Back River Reservoir as the flow changed from zero to 5250 cfs. During the zero flow period of the hydrograph, the salinity front moved into the reservoir and during the 5250-cfs flow period, the salinity front was moved out of the reservoir. This action continued throughout the hydrograph. For the Schedule E hydrograph, the salt did not move into the Back River Reservoir.

43. Salinity profiles for bottom depths at high-water slack for Cooper River during Pinopolis release Schedules C and E are shown in Plates 120 and 121, respectively. The salinity values shown in the two plates were determined by averaging measurements made on Tuesday after the zero flow period of the weekly release hydrograph and by averaging measurements made on Saturday after the high-flow period (Tables 1 and 2). During the hydrograph week, the salinity front would migrate between the two extremes.

44. The upstream limit of intrusion (100 ppm) of ocean salt water (high-water slack, bottom) was at approximately mile 43 for the 3000-cfs flow Schedule C (Plate 120). The upstream limit of intrusion of ocean salt water for the 3500-cfs flow Schedule E was at approximately mile 41 (Plate 121).

45. Profiles of salinity concentrations in Cooper River for bottom depths, at time of high-water slack, for the two schedules tested are repeated in Plate 122 for direct comparison of the effects of each schedule on the salinity distribution in the Cooper River during the zero flow period.

PART V: CONCLUSIONS

46. Based on the results of the model tests reported herein, the following conclusions have been derived regarding dye dispersion and salinity intrusion in the Charleston Estuary:

a. For the Schedule C hydrograph and continuous dye release at Cooper River mile 37 (sta 37C), measurable concentrations reached the Back River Reservoir (sta BR1) within four tidal cycles after the release (Test 1). The maximum concentrations at BR1 were about 0.4 percent of initial concentration and about 0.6 percent at sta BR2. During the period of sustained zero flow (cycles 56-75), dye concentrations were increased to about 1.0 percent at sta BR1 and BR2.

b. For the Schedule C hydrograph and the dye released at Cooper River mile 37 (sta 37C) at the rate of 30 cfs during each ebb phase of the tide and 0 cfs during each flood phase, measurable dye concentrations reached the Back River Reservoir (sta BR1) within four tidal cycles after the release (Test 2). The maximum concentration observed at BR1 was about 0.5 percent of initial concentration and about 0.3 percent at sta BR2. Comparison of Test 2 results with the continuous dye release at mile 37 (Test 1) showed that the dye arrived at sta BR1 about the same time with a noticeable reduction in the average maximum concentration in the Back River Reservoir from about 0.5 percent of initial concentration (Test 1) to about 0.4 percent (Test 2).

c. For the Schedule C hydrograph and continuous dye release at Cooper River mile 33 (sta 33C), measurable dye concentrations reached the Back River Reservoir (sta BR1) within five tidal cycles after the release (Test 3). The maximum concentration observed at BR1 was about 0.09 percent of initial concentration and about 0.05 percent at sta BR2. Comparison of Test 3 with the continuous dye release at mile 37 (Test 1) showed that the dye arrived at sta BR1 about one tidal cycle later with a noticeable reduction in the average maximum concentration in the Back River Reservoir from about 0.5 percent of initial concentration (Test 1) to about 0.07 percent (Test 3).

d. For the Schedule C hydrograph and continuous dye released at Cooper River mile 33 (sta 33C) at the rate of 30 cfs during each ebb phase of the tide and 0 cfs during each flood phase, measurable dye concentrations reached the Back River Reservoir (sta BR1) within five tidal cycles after the release (Test 4). The maximum concentration

observed at BR1 was about 0.11 percent of initial concentration and about 0.08 percent at sta BR2.

e. For the Schedule C hydrograph and continuous dye release at Cooper River mile 30 (sta 30C), measurable dye concentrations reached the Back River Reservoir (sta BR1) within 25 tidal cycles after the release (Test 5). The maximum concentration observed at BR1 and BR2 was about 0.02 percent of initial concentration during normal operation of Schedule C. During the period of zero flow (cycles 56-68), dye moved into the Back River Reservoir with maximum concentrations of about 0.09 to 0.13 percent of initial concentration. After resuming the Schedule C hydrograph, the dye was flushed from sta BR1 with about 0.02 to 0.05 percent still remaining at sta BR2, BR3, and BR4 when the test was terminated, Comparison of the results of Test 5 (dye released at mile 30) with the results of Test 1 (dye released at mile 37) showed that the dye arrived at sta BR1 about 21 tidal cycles later with a reduction in the average maximum concentration in the Back River Reservoir from about 0.5 percent of initial concentration (Test 1) to about 0.02 percent (Test 5). Comparison of Test 5 with Test 3 (dye released at mile 33) showed that the dye arrived at sta BR1 about 20 tidal cycles later with a reduction in the average maximum concentration in Back River Reservoir from about 0.07 percent of initial concentration (Test 3) to about 0.02 (Test 5).

f. For the Schedule E hydrograph and continuous dye release at Cooper River mile 37 (sta 37C), measurable dye concentrations reached the Back River Reservoir (sta BR1) within three tidal cycles after the release (Test 6). The maximum concentration observed at BR1 was about 0.25 percent of initial concentration and about 0.2 percent at sta BR2. Comparison of the results of Test 6 (Schedule E hydrograph and dye released at mile 37) with the results of Test 1 (Schedule C hydrograph and dye released at mile 37) showed that within four tidal cycles the average maximum concentration was observed in the Back River Reservoir with an average maximum of about 0.5 percent of initial concentration for Test 1 and 0.25 percent for Test 6.

g. For the Schedule C hydrograph, maximum salinities in the Back River Reservoir varied from 15 ppm total salt at sta BR1 to 46 ppm at sta BR2. For the Schedule E hydrograph, the maximum salinities varied from 10 ppm at sta BR1 to 15 ppm at sta BR2 and BR3.

h. The upstream limit of intrusion (100 ppm) of ocean salt water (*high-water slack, bottom*) was approximately Cooper River mile 43 (sta 43C) for Schedule C and approximately Cooper River mile 41 (sta 41C) for Schedule E.

Table 1

Schedule C Pinopolis Releases After Rediversion

Zero Flow for 72 hr; Weekly Average 3000 cfs

Hour	Sunday P	Sunday M	Monday P	Monday M	Tuesday P	Tuesday M	Wednesday P	Wednesday M	Thursday P	Thursday M	Friday P	Friday M	Saturday P	Saturday M
1 a.m.	0	0	0	0	0	0	1,200	5,250	1,200	5,250	1,200	5,250	1,200	5,250
2														
3														
4														
5														
6														
7														
8							3,700		3,700		3,700		3,700	
9							7,500		7,500		7,500		7,500	
10														
11														
12 N														
1 p.m.														
2														
3														
4														
5							8,900		8,900		8,900		8,900	
6														
7														
8														
9														
10							5,000		5,000		5,000		5,000	
11							3,200		3,200		3,200		3,200	
12 M							1,200		1,200		1,200		1,200	
Total	0		0		0		126,000		126,000		126,000		126,000	
Daily average	0		0		0		5,250		5,250		5,250		5,250	

Table 2

Schedule E Pinopolis Releases After Rediversion

Zero Flow for 69 hr; Weekly Average 3500 cfs

Hour	Sunday		Monday		Tuesday		Wednesday		Thursday		Friday		Saturday	
	P	M	P	M	P	M	P	M	P	M	P	M	P	M
1 a.m.	0	0	0	0	0	0	1,200	5,250	1,200	5,250	1,200	5,250	1,200	5,250
2														
3														
4														
5														
6														
7														
8							3,700		3,700		3,700		3,700	
9							7,500		7,500		7,500		7,500	
10														
11														
12 N														
1 p.m.														
2														
3														
4														
5							8,900		8,900		8,900		8,900	
6														
7														
8														
9														
10					28,500	28,500	5,000		5,000		5,000		5,000	
11					28,500	28,500	3,200		3,200		3,200		3,200	
12 M					28,500	28,500	1,200		1,200		1,200		1,200	
Total	0		0		85,500		126,000		126,000		126,000		126,000	
Daily average	0		0		3,560		5,250		5,250		5,250		5,250	

Table 3

Dye Release Summary Table

Test	Pinopolis Release Schedule	Continuous Dye Release of 15 cfs at River Mile	EBB Dye Release of 30 cfs at River Mile	Arrival Time Cycles After Release			Maximum Concentration Percent of Initial Concentration				
				BRC	BR1	BR2	BRC	BR1	BR2	BR3	BR4
1	C	37		1	4	3	0.9	0.4	0.6		
2	C		37	1	4	5	0.8	0.5	0.3		
3	C	33		3	5	6	0.15	0.09	0.05	0.05	0.04
4	C		33	4	5	8	0.2	0.11	0.08		
5	C	30		5	25	25	0.04	0.02	0.02	0.01	0.01
6	E	37		1	3	4	0.4	0.25	0.2	0.16	0.15

Table 4

High-Water Slack Bottom Salinities (ppm) at Selected Locations for Pinopolis Release Schedule C, Test 1

Flow cfs	Cycles After Stability	Salinity, ppm Tee	43C	BRC	BR1	BR2
0	1	100				110
	2		60			
	3	160				100
	4		110			
	5	370				100
	6		270			
5250	7	770				90
	8		150			
	9	470				80
	10		70			
	11					
	12					
	13					
	14	90				100
0	15		50			
	16					
	17					
	18					
	19	510				80
	20		180			
5250	21					
	22					
	23					
	24	280				70
	25		40			
	26					
	27					
	28					
0	29	100				80
	30		50			
	31					
	32					
	33					
	34	480				60

(Continued)

(Sheet 1 of 3)

Table 4 (Continued)

Flow cfs	Cycles After Stability	Salinity, ppm Tee	43C	BRC	BR1	BR2
5250	35		180			
	36					
	37					
	38					
	39	140				60
	40		50			
	41					
	42					
0	43					
	44	50				90
	45		80			
	46					
	47					
	48					
5250	49	580				70
	50		70			
	51					
	52					
	53					
	54	120				50
	55		40			
	56					
0	57					
	58					
	59	90		10		90
	60		110		90	
	61	270		40		
	62				120	
	63	640	230	50	140	150
	64		340		180	
	65	1020		110		280
	66		680		250	
	67	1720		220		230
	68		1120		350	
	69	2320		440	540	480
	70		1620		650	

(Continued)

Table 4 (Concluded)

Flow cfs	Cycles After Stability	Salinity, ppm Tee	43C	BRC	BR1	BR2
0	71				1190	
↓	72					
	73					
	74		3620	1120	1320	690
	75		2720		1340	
28,500	76		60	310		780
↓	77		20		540	
	78		10	60	650	1790
	79		10		440	
	80	60	0	0	260	1710
	81		0		140	
	82	0	0	30	80	1780
	83		0		40	
	84	0	0	0	40	1650
	85		0		20	
	86	0	0	0	20	1490
	87		0		40	
	88					

(Sheet 3 of 3)

Table 5

High-Water Slack Bottom Salinities (ppm) at Selected Locations for Pinopolis Release Schedule C, Test 1R

Flow cfs	Cycles After Stability	Salinity, ppm Tee	43C	BRC	BR1	BR2	BR3	BR4
0	1		10	0				
	2		10	0				
	3		20	90				
	4		60	20				
	5		120	40				
	6	650	200	90	20	10	20	30
5250	7		190	170				
	8		80	130				
	9		50	70				
	10		20	40				
	11		20	30				
	12		20	30				
	13		10	20				
	14	60	10	10	10	20	20	20
0	15							
	16							
	17							
	18							
	19							
	20	530	190	90	30	20	30	180
5250	21							
	22							
	23							
	24							
	25							
	26							
	27							
	28	60	30	10	20	30	20	60
0	29							
	30							
	31							
	32							
	33							
	34	360	100	50	20	20	20	40

(Continued)

Table 5 (Continued)

Flow cfs	Cycles After Stability	Salinity, ppm Tee	43C	BRC	BR1	BR2	BR3	BR4
5250	35							
	36							
	37							
	38							
	39							
	40							
	41							
	42	40	20	10	10	20	20	80
0	43							
	44							
	45							
	46							
	47							
	48	490	160	70	20	20	30	60
5250	49							
	50							
	51							
	52							
	53							
	54							
	55							
	56	50	30	10	20	30	60	40
0	57							
	58							
	59		30	10		20		
	60	130	60	10	20	20	40	80
	61		70	20		20		
	62		120	60		20		
5250	63		110	100		60		
	64		60	90		50		
	65		40	50		40		
	66		30	30		90		
	67	110	20	20	30	70	30	40
	68		10	20		80		
	69		0	0		80		
	70	50	0	0	20	50	30	30
0	71		0	0		70		
	72		0	10		60		
	73		10	0		70		
	74	50	20	0	10	60	50	30

(Continued)

Table 5 (Concluded)

Flow cfs	Cycles After Stability	Salinity, ppm Tee	43C	BRC	BR1	BR2	BR3	BR4
0	75		50	10		30		
	76		170	40		70		
	77		260	180		40		
	78		370	200		70		
	79		500	280		60		
	80		710	440		60		
	81	2420	1120	700	330	50	40	60
	82		1720	1020		90		
	83		2020	1320		200		
	84		2220	1820		320		
	85		2520	2120		450		
	86		2720	2320		610		
	87		2820	2520		810		
	88		3120	2720		1020		
	89	4220	3320	3020	1720	1120	780	520
28,500	90		50	3120		1320		
	91		10	100		2120		
	92		0	30		2220		
	93		0	10		2220		
	94		20	20		2120		
	95		10	0		2220		
	96		0	0		2120		
	97		0	0		2120		
	98		0	0		2020		
	99		0	0		2020		
	100		10	0		1920		
	101		30	10		1620		

(Sheet 3 of 3)

Table 6

High-Water Slack Bottom Salinities (ppm) at Selected Locations for Pinopolis Release Schedule C, Test 2

Flow cfs	Cycles After Stability	Salinity, ppm Tee	43C	BR2
0	1	180		
	2		30	
	3	160		190
	4		120	
	5	430		70
	6		290	
5250	7	810		70
	8		150	
	9	460		80
	10		60	
	11			
	12			
	13			
	14	80		80
0	15		20	
	16			
	17			
	18			
	19	270		60
	20		190	
5250	21			
	22			
	23			
	24	170		110
	25		20	
	26			
	27			
	28			
0	29	30		60
	30		10	
	31			
	32			
	33			
	34	540		50

(Continued)

Table 6 (Concluded)

Flow cfs	Cycles After Stability	Salinity, ppm Tee	43C	BR2
5250	35		140	
	36			
	37			
	38			
	39	220		90
	40		20	
	41			
	42			
0	43			
	44	80		50
	45		40	
	46			
	47			
	48			
5250	49	540		140
	50		70	
	51			
	52			
	53			
	54	140		60
	55		20	
	56			
0	57			
	58			
	59	70		50
	60		50	

Table 7

High-Water Slack Bottom Salinities (ppm) at Selected Locations for Pinopolis Release Schedule C, Test 2R

Flow cfs	Cycles After Stability	Salinity, ppm				
		Tee	43C	BRC	BR1	BR2
0	1					
↓	2					
	3					
	4					
	5					
	6	330	140	300	10	20
5250	7					
↓	8					
	9					
	10					
	11					
	12					
	13					
	14	30	20	140	10	20
0	15					
↓	16					
	17					
	18					
	19					
	20	350	110	110	10	10
5250	21					
↓	22					
	23					
	24					
	25					
	26					
	27					
	28	20	0	20	10	20
0	29					
↓	30					
	31					
	32					
	33					
	34	290	80	20	0	30

(Continued)

Table 7 (Concluded)

Flow cfs	Cycles After Stability	Salinity, ppm Tee	43C	BRC	BR1	BR2
5250	35					
	36					
	37					
	38					
	39					
	40					
	41					
	42	60	30	60	0	10
0	43					
	44					
	45					
	46					
	47					
	48	260	70	60	20	10
5250	49					
	50					
	51					
	52					
	53					
	54					
	55					
	56	10	10	30	0	10
0	57					
	58					
	59					
	60	50	30	100	20	10

Table 8

High-Water Slack Bottom Salinities (ppm) at Selected Locations for Pinopolis Release Schedule C, Test 3

Flow cfs	Cycles After Stability	Salinity, ppm						
		Tee	43C	BRC	BR1	BR2	BR3	BR4
0	1	30	0			20		
	2			0	10	30	0	0
	3	90	0			20		
	4			10	0		0	10
	5	310	30			10		
	6			50	10		0	0
5250	7	450	90			10		
	8			90	40	20	0	10
	9	310	10			10		
	10			20	20		0	10
	11							
	12					30	0	10
	13							
	14	40	0	20	20	10		
0	15			0	0		0	10
	16							
	17							
	18							
	19	160	20			10		
	20		60	20	10	10	10	30
5250	21							
	22							
	23							
	24	110	0			10		
	25			20	10		10	10
	26							
	27							
	28		0	10	0	20		
0	29	30	0			10		
	30			0	0		10	10
	31							
	32							
	33					10		
	34	410	90	40	10	0		

(Continued)

Table 8 (Continued)

Flow cfs	Cycles After Stability	Salinity, ppm Tee	43C	BRC	BR1	BR2	BR3	BR4
5250	35			60	20		10	50
	36							
	37							
	38							
	39	120	0			10		
	40			20	10		10	10
	41							
	42		0	0	10	30		
0	43							
	44	30	0			20		
	45			0	0		10	20
	46							
	47					20		
	48		80	30	10			
5250	49	350	40			0		
	50			70	30		20	30
	51							
	52							
	53							
	54	70	0			20		
	55			10	10	20	10	20
	56		0	0	20			
0	57							
	58							
	59	60	10			10		
	60			20	0		20	30
	61							
	62		90	40	10	20		
5250	63							
	64	310	40			10		
	65			50	20		20	20
	66							
	67							
	68							
	69	40	0			20		
	70		0	10	10	10	20	20
0	71							
	72							
	73							
	74	180	10			10		
	75			20	10		20	30
	76		80	30	10			

(Continued)

Table 8 (Concluded)

Flow cfs	Cycles After Stability	Salinity, ppm Tee	43C	BRC	BR1	BR2	BR3	BR4
5250	77							
	78							
	79	210	10			30		
	80			30	10		20	30
	81							
	82							
	83							
	84	30	0	0	0	20		
0	85			0	0		20	30
	86							
	87							
	88							
	89	200	20			20		
	90		40	20	10	10	20	30
5250	91							
	92							
	93							
	94	170	0			30		
	95			20	10		20	30
	96							
	97							
	98		0	0	0	10		
0	99	30	0	10		40		
0	100		0	10	0	20	60	30
1135	101		10	10		20		
	102		10	10		20		
	103		50	10		20		
	104		50	30		40		
	105		60	60		10		
	106		90	60		20		
	107		120	60		30		
	108		160	120		20		
	109		190	150		40		
	110		150	170		30		
	111		260	190		30		
	112		260	230		40		
	113		260	240		50		
	114		370	220		50		
	115		410	300		60		
	116		410	330		80		
	117		460	340		80		
	118		500	360		90		
	119		560	400				
	120		570	450		150		

(Sheet 3 of 3)

Table 9

High-Water Slack Bottom Salinities (ppm) at Selected Locations for Pinopolis Release Schedule C, Test 4

Flow cfs	Cycles After Stability	Salinity, ppm Tee	43C	BR2
0	1	50		40
	2		30	
	3	110		30
	4		40	
	5	300		20
	6		130	
5250	7	70		40
	8		100	
	9	320		20
	10		20	
	11			
	12			
	13			
	14	80		30
0	15		20	
	16			
	17			
	18			
	19	260		20
	20		80	
5250	21			
	22			
	23			
	24	250		20
	25		0	
	26			
	27			
	28			
0	29	60		40
	30		30	
	31			
	32			
	33			
	34	270		50

(Continued)

Table 9 (Concluded)

Flow cfs	Cycles After Stability	Salinity, ppm Tee	43C	BR2
5250	35		30	
	36			
	37			
	38			
	39	80		20
	40		0	
	41			
	42			
0	43			
	44	20		20
	45		10	
	46			
	47			
	48			
5250	49	800		20
	50		50	
	51			
	52			
	53			
	54	150		20
	55		0	
	56			
0	57			
	58			
	59	150		60
	60		50	

Table 10

High-Water Slack Bottom Salinities (ppm) at Selected Locations for Pinopolis Release Schedule C, Test 5

Flow cfs	Cycles After Stability	Salinity, ppm						
		Tee	43C	BRC	BR1	BR2	BR3	BR4
0	1	30		10		110		
	2		20		10		40	20
	3	120		10		100		
	4		70		10		40	10
	5	240		20		70		
	6		60	50	10		40	20
5250	7	380		100				
	8		0		30		40	10
	9	170		30		50		
	10		0		10		40	10
	11							
	12						40	30
	13							
	14	20	0	0	0	30		
0	15		0		0		40	40
	16							
	17							
	18							
	19	300		40		50		
	20		50	50	0		30	20
5250	21							
	22							
	23							
	24	170		30		40		
	25		10		10		30	40
	26							
	27							
	28		10	0	0			
0	29	20		0		30		
	30		20				30	30
	31							
	32							
	33							
	34	430	70	50	0	40		

(Continued)

Table 10 (Continued)

Flow cfs	Cycles After Stability	Salinity, ppm Tee	43C	BRC	BR1	BR2	BR3	BR4
5250	35		10		10		20	30
	36							
	37							
	38			10				
	39	70				40		
	40		0		10		80	20
	41							
	42		10	0	0			
0	43							
	44	20		0		40		
	45		40		0		20	20
	46							
	47							
	48		40	50	0			
5250	49	470		110		30		
	50		30		30		30	20
	51							
	52							
	53							
	54	70		0		50		
	55		10		0		30	30
	56		0	0	0			
0	57							
	58							
	59	140		0		40		
	60		60		0		40	20
	61	180	100	50	10	20		
	62		50	80	10		30	20
	63	730	290	150	30	20		
	64		100	230	90		30	30
	65	1910	460	330	150	40		
	66		770	560	210		20	30
	67	2210	340	720	300	100		
	68		1110	900	410		30	20
5250	69	2510	910		560	290		
	70		660	890	620		100	
	71			680	470	490		
	72		250	420	350		340	240
	73	530	140	250	260	370		
	74		120	150	240		360	360
	75	360	50	110	200	330		
	76		30	90	70			

(Continued)

Table 10 (Concluded)

Flow cfs	Cycles After Stability	Salinity, ppm Tee	43C	BRC	BR1	BR2	BR3	BR4
0	77	200	30	50	50	300	360	350
	78		70	50	70			360
	79	260	120	70	70	240	360	
	80		70	110	60		350	360
	81		150	130	70	180		
	82		220	160	80		290	360
5250	83	540	200	200	230	150		
	84		120	180	120		310	320
	85	390	60	140	80	140		
	86			70	60		270	320
	87	20	30	50	40	130		
	88		20	30	20		210	340
	89	50	0	20	20	130		
	90		0	10	10		200	300
0	91	80	10	0	0	110		
	92		10	0	0		180	320
	93	70	20	10	0	110		
	94		20	30	0		180	
	95	590	30	30	10	100		
	96		50	60	20	80	140	260

(Sheet 3 of 3)

Table 11

High-Water Slack Bottom Salinities (ppm) at Selected Locations for Pinopolis Release Schedule E, Test 6

Flow cfs	Cycles After Stability	Salinity, ppm						
		Tee	43C	BRC	BR1	BR2	BR3	BR4
0	1	40	10					
	2			0	0	10	0	0
	3	170	0					
	4			0	10	0	20	10
	5	120	20					
28,500 3 hr	6			10	30	10	0	0
5250	7	40	40					
	8	.		10	10	0	0	0
	9	30	60					
	10			0	0	10	30	0
	11	20	10					
	12			10	0	10		
	13	0	0	0	0	10	20	0
	14	30	0	0	0	0		
0	15							
	16	0	0	0				
	17				0	0		
	18							
	19			10	0	10	10	20
28,500 3 hr	20	320						
5250	21							
	22							
	23	40	30					
	24			0	0	0		
	25							
	26			0	20	10	20	
	27			0	20	0	20	
	28	0	0					
0	29							
	30	40	0					
	31			0				
	32				0	0		
	33			0	0	0	20	20

(Continued)

Table 11 (Concluded)

Flow cfs	Cycles After Stability	Salinity, ppm Tee	43C	BRC	BR1	BR2	BR3	BR4
28,500 3 hr	34	170	30					
5250	35							
	36							
	37	10	0					
	38			0	10	0		
	39							
	40							
	41			0	0	0	20	30
	42	0	0					
0	43							
	44	10	0					
	45			0	10	0		
	46							
	47			0	0	10	10	10
28,500 3 hr	48	250	10					
5250	49							
	50							
	51	20	0					
	52			0	0	0		
	53							
	54							
	55			0	0	0	20	10
	56	0	0					
0	57							
	58	0	10		0			
	59			0	0	0	20	20
	60	20	10		0			
	61			0	0	0	10	20
	62	150	30		0			
	63			0	0	0	40	
	64	670	140		10			
	65	170		170	30	0	0	70
	66	1010	330		70			
	67			620	130	0	0	20
	68	1610	620		210			
	69			740	280	40	0	10
	70	2110	1410		390			
	71			1310	470	160	0	0
	72	2510	1510		590			
	73			1110	680	340	0	100
	74				790			

Table 12

High-Water Slack Bottom Salinities (ppm) at Selected Locations for Pinopolis Release Schedule E, Test 6R

Flow cfs	Cycles After Stability	Salinity, ppm						
		Tee	43C	BRC	BR1	BR2	BR3	BR4
0	1	0	0					
	2			0	0	10	10	10
	3	20	0					
	4			0	0	10	10	10
	5	80	20					
28,500 3 hr	6			20	0	0	10	0
5250	7	50	10					
	8			10	10	10	10	0
	9	80	20					
	10			0	10		10	10
	11	20	0					
	12			0	0	10		
	13	10	0	0	0	10	10	0
	14	10	0	10	0	10		
0	15							
	16	10	0					
	17			0	0	10		
	18							
	19			0	0	20	10	10
28,500 3 hr	20	140	30					
5250	21							
	22							
	23	20	0					
	24			0	0	10		
	25							
	26							
	27			0	0	10	10	20
	28	10	0					
0	29							
	30	10	20					
	31			0	0	10		
	32							
	33			0	0	10	10	10

(Continued)

Table 12 (Concluded)

Flow cfs	Cycles After Stability	Salinity, ppm Tee	43C	BRC	BR1	BR2	BR3	BR4
28,500 3 hr	34	130	20					
5250	35							
	36							
	37	30	0					
	38			0	0	10		
	39							
	40							
	41			0	0	0	10	20
	42	0	0					
0	43							
	44	10	0					
	45			0	0	10		
	46							
	47			0	0	0	10	20
28,500 3 hr	48	220	80					
5250	49							
	50							
	51	60	10					
	52			30	0	10		
	53							
	54							
	55			0	0	10	10	10
	56	10	0					
0	57							
	58	30	0					
	59			0	0	10	10	10
	60	40	10					
	61			0	0	10	20	20
28,500 3 hr	62	160	30					

Table 13

High-Water Slack Bottom Salinities, ppm, at Selected Locations for Pinopolis Release Schedules C and E

40-Ft Cooper River Navigation Channel to Mile 23.0

Test No.	Freshwater Release Schedule Avg Weekly Flow, cfs	Tee Max	Tee Min	Cooper River Mile 43 Max	Cooper River Mile 43 Min	Back River Canal (BRC) Max	Back River Canal (BRC) Min	SCE and G Intake (BR1) Max	SCE and G Intake (BR1) Min	Verona Intake (BR2) Max	Verona Intake (BR2) Min	Foster Creek Intake (BR3) Max	Foster Creek Intake (BR3) Min	Dam Intake (BR4) Max	Dam Intake (BR4) Min
		Total Salt, ppm						Back River Reservoir							
1	C-3000	480	45	180	50	--	--	--	--	80	60	--	--	--	--
1R	C-3000	550	55	160	20	80	0	20	0	20	20	40	20	60	35
2	C-3000	540	70	140	20	--	--	--	--	100	50	--	--	--	--
2R	C-3000	310	30	100	15	65	35	10	5	20	15	--	--	--	--
3	C-3000	300	30	90	0	50	10	20	0	20	0	20	20	30	20
4	C-3000	300	60	80	0	--	--	--	--	40	20	--	--	--	--
5	C-3000	460	20	70	0	50	0	10	0	40	20	30	25	30	20
	Average	420	44	117	15	61	11	15	0	46	28	30	22	40	25
6	E-3500	220	0	25	0	0	0	20	20	20	15	20	10	20	10
6R	E-3500	160	10	40	0	0	0	0	0	10	10	10	10	20	10
	Average	190	5	33	0	0	0	10	10	15	13	15	10	20	10

Note: Maximum salinity data obtained after zero flow period of hydrograph while minimum salinities were obtained after 5250-cfs flow period of hydrograph.

Table 14

High-Water Slack Bottom Salinities, ppm at Selected Locations for Zero Release at Pinopolis, 40-Ft Cooper River Navigation Channel at Mile 23.0

Schedules C and E

Cycles of Zero Flow	Total Salt, ppm: Test 1, Schedule C				Test 1R, Schedule C				Test 5, Schedule C				Test 6, Schedule E			
	43	BRC	BR1	BR2	43	BRC	BR1	BR2	43	BRC	BR1	BR2	43	BRC	BR1	BR2
0	--	--	40	--	0	0	20	50	0	0	0	--	0	--	--	--
1	--	--	--	--	0	0	--	70	--	--	--	--	--	--	--	--
2	--	--	--	--	0	10	--	60	--	--	--	--	--	--	0	--
3	--	10	--	90	10	0	--	70	--	0	--	40	--	--	0	--
4	110	--	90	--	20	0	10	60	60	--	--	--	--	--	0	--
5	--	40	--	--	50	10	--	30	100	50	10	20	--	10	0	0
6	--	--	120	--	170	40	--	70	50	80	--	--	0	--	0	--
7	230	50	140	150	260	180	--	40	290	150	30	20	--	0	0	0
8	340	--	180	--	370	200	--	70	100	230	--	--	140	--	10	--
9	--	110	--	280	500	280	--	60	460	330	150	40	--	170	30	0
10	680	--	250	--	710	440	--	60	770	560	210	--	330	--	70	--
11	--	220	--	230	1120	700	330	50	340	720	300	100	--	620	130	0
12	1120	--	350	--	1720	1020	--	90	1110	900	410	--	620	--	210	--
13	--	440	540	480	2020	1320	--	200					--	740	280	40
14	1620	--	650	--	2220	1820	--	320					1410	--	390	--
15	--	--	1190	--	2520	2120	--	450					--	1310	470	160
16	--	--	--	--	2720	2320	--	610					1510	--	590	--
17	--	--	--	--	2820	2520	--	810					--	1110	680	340
18	--	1120	1320	690	3120	2720	--	1020					--	--	790	--
19	2720	--	1340	--	3320	3020	1720	1120					--	--	--	--

Note: Five weeks (ending on Saturday) of Schedules C and E preceded zero flow. Cycle 7 is the first additional cycle of zero flow (both Schedules C and E started with 3 days of zero flow).

Table 15

High-Water Slack Bottom Salinities, ppm, at Selected Locations for Zero and 1135-cfs Release at Pinopolis, 40-Ft Cooper River Navigation Channel to Mile 23.0, Schedule C

Test 1R				Test 3			
Cycles of Zero Flow	Total Salt, ppm			Cycles of 1135 cfs	Total Salt, ppm		
	Mile 43	BRC	BR2		Mile 43	BRC	BR2
0	0	0	50	0	0	10	20
1	0	0	70	1	10	10	20
2	0	10	60	2	10	10	20
3	10	0	70	3	50	10	20
4	20	0	60	4	50	30	40
5	50	10	30	5	60	60	10
6	170	40	70	6	90	60	20
7	260	180	40	7	120	60	30
8	370	200	70	8	160	120	20
9	500	280	60	9	190	150	40
10	710	440	60	10	--	170	30
11	1120	700	50	11	260	190	30
12	1720	1020	90	12	260	230	40
13	2020	1320	200	13	260	240	50
14	2220	1820	320	14	370	220	50
15	2520	2120	450	15	410	300	60
16	2720	2320	610	16	410	330	80
17	2820	2520	810	17	460	340	80
18	3120	2720	1020	18	500	360	90
19	3320	3020	1120	19	560	400	--
20				20	570	450	150

Note: Five weeks of Schedule C preceded 0-cfs release while 8 weeks of Schedule C preceded 1135-cfs release.

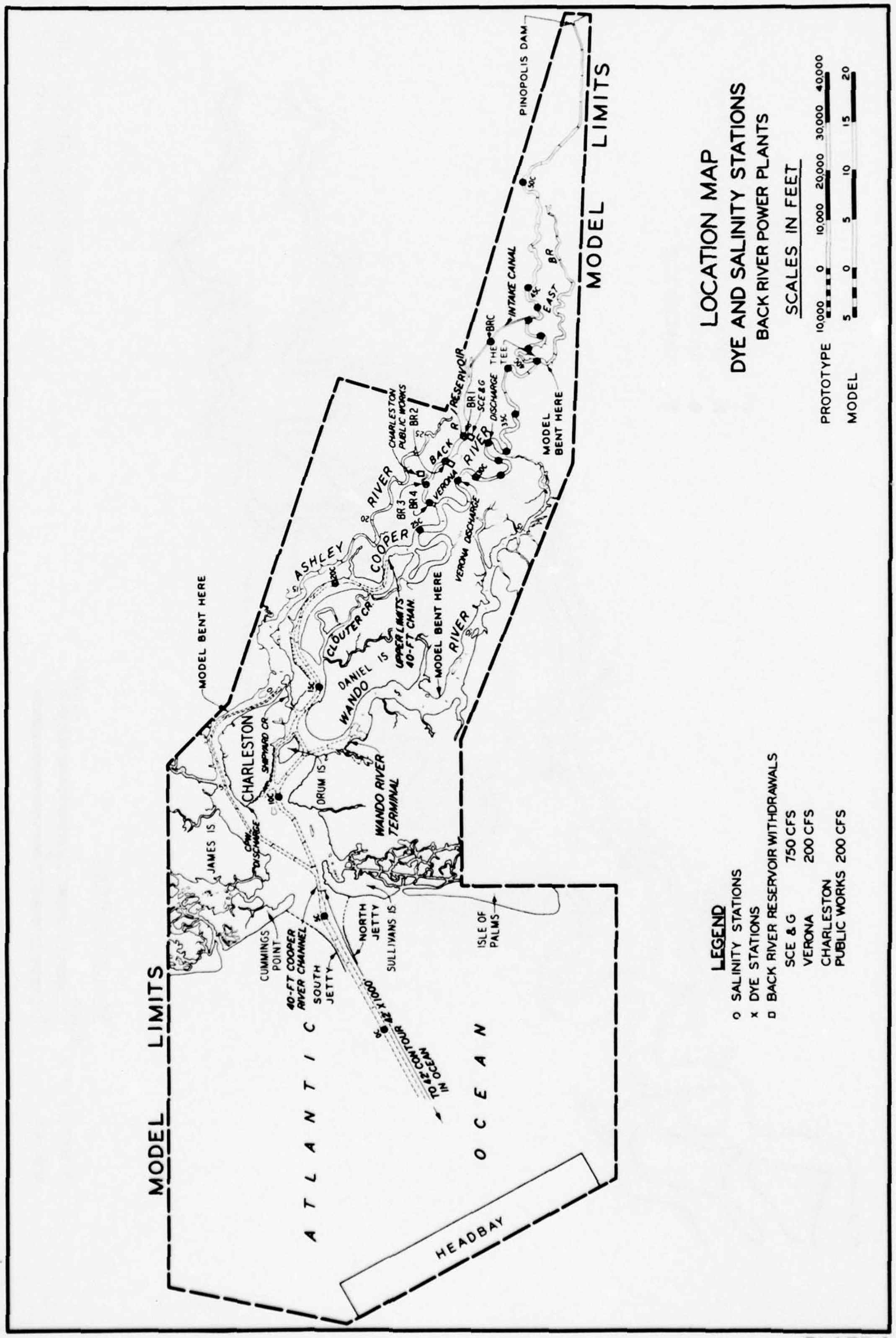

LOCATION MAP
DYE AND SALINITY STATIONS
BACK RIVER POWER PLANTS
SCALES IN FEET
PROTOTYPE 10,000 0 10,000 20,000 30,000 40,000
MODEL 5 0 5 10 15 20
LEGEND
o SALINITY STATIONS
x DYE STATIONS
□ BACK RIVER RESERVOIR WITHDRAWALS
SCE & G 750 CFS
VERONA 200 CFS
CHARLESTON PUBLIC WORKS 200 CFS
MODEL LIMITS
MODEL LIMITS
HEADBAY
ATLANTIC OCEAN
TO 42' CONTOUR IN OCEAN
40-FT COOPER RIVER CHANNEL
CUMMINGS POINT
SOUTH JETTY
NORTH JETTY
SULLIVANS IS
ISLE OF PALMS
JAMES IS
CHARLESTON
SHIPYARD CR
DRUM IS
WANDO RIVER TERMINAL
MODEL BENT HERE
DANIEL IS
WANDO
CLOUTER CR
UPPER LIMITS 40-FT CHAN
MODEL BENT HERE
RIVER
ASHLEY
COOPER
RIVER
VERONA DISCHARGE
VERONA
BR 3
BR 4
BACK R
RIVER
CHARLESTON PUBLIC WORKS
BR2
BR1
RESERVOIR
SCE & G DISCHARGE
THE TEE
BRC
INTAKE CANAL
EAST BR
MODEL BENT HERE
PINOPOLIS DAM

PLATE 1

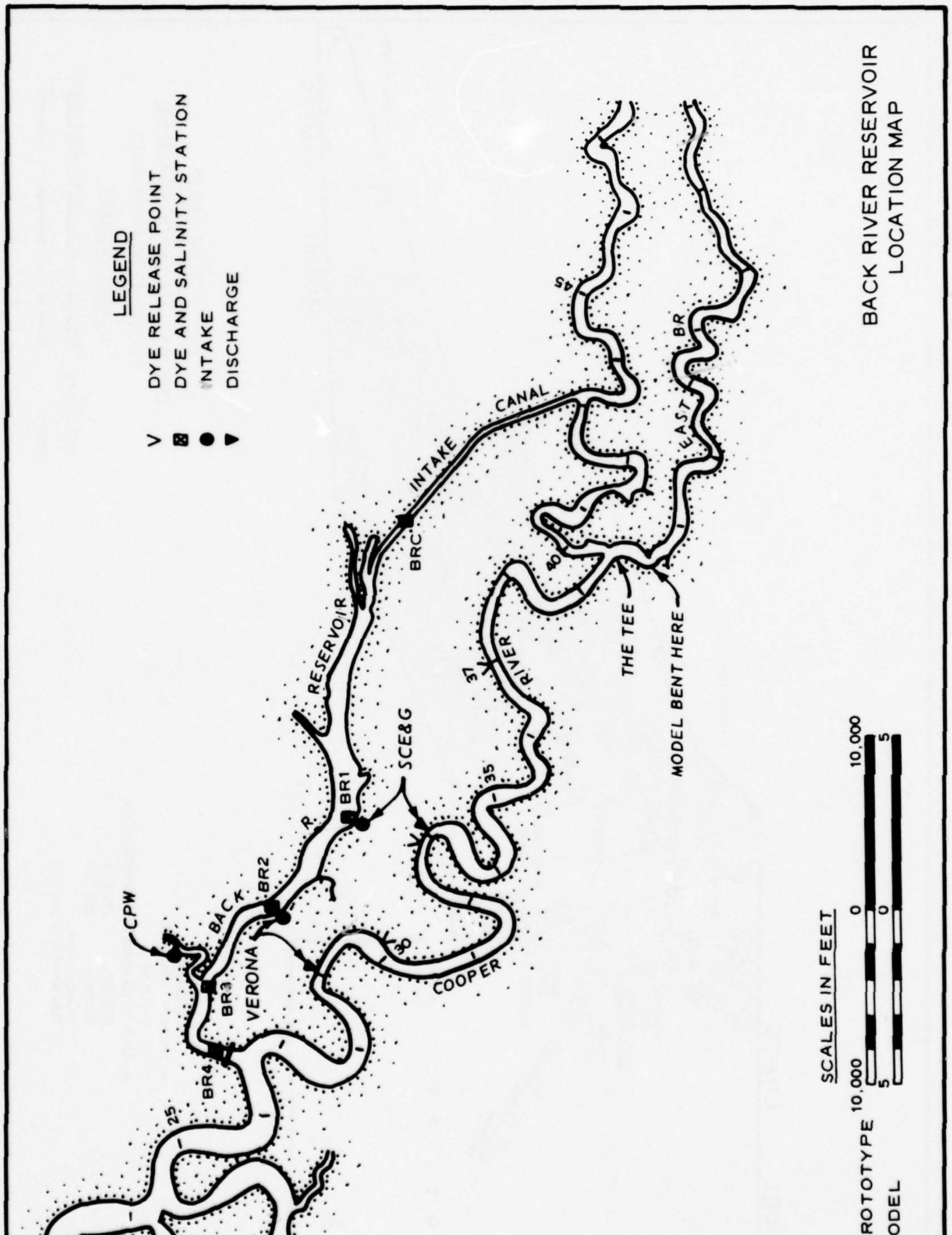
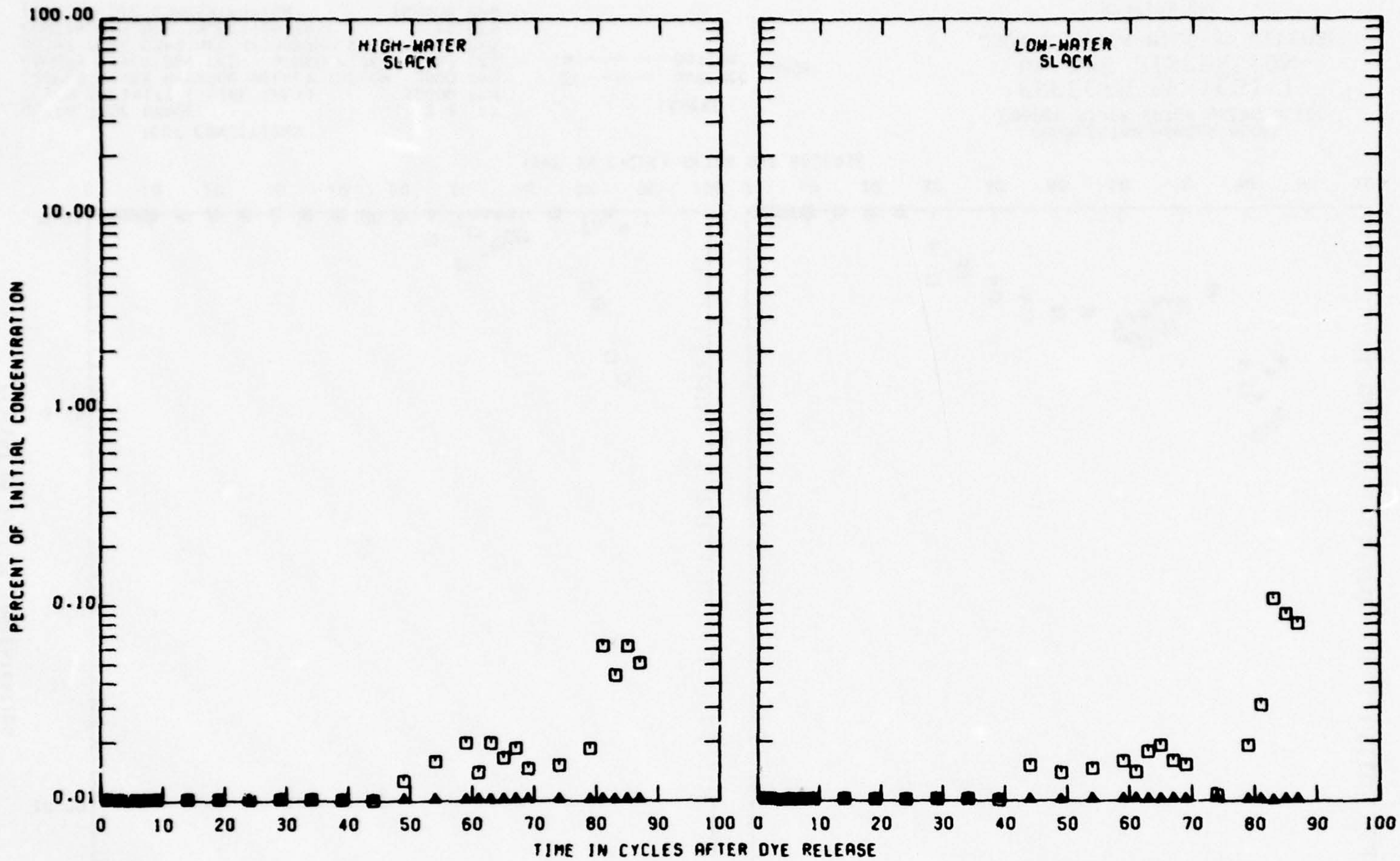

LEGEND
DYE RELEASE POINT
DYE AND SALINITY STATION
INTAKE
DISCHARGE
BACK RIVER RESERVOIR
LOCATION MAP
CPW
BACK
R.
RESERVOIR
BR1
BR2
BR3
BR4
VERONA
BRC
INTAKE
CANAL
SCE&G
COOPER
RIVER
25
30
35
37
40
45
EAST
BR
THE TEE
MODEL BENT HERE
SCALES IN FEET
PROTOTYPE 10,000 0 10,000
MODEL 5 0 5

PLATE 2



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

□ ——— SURFACE BASE
△ — — — BOTTOM

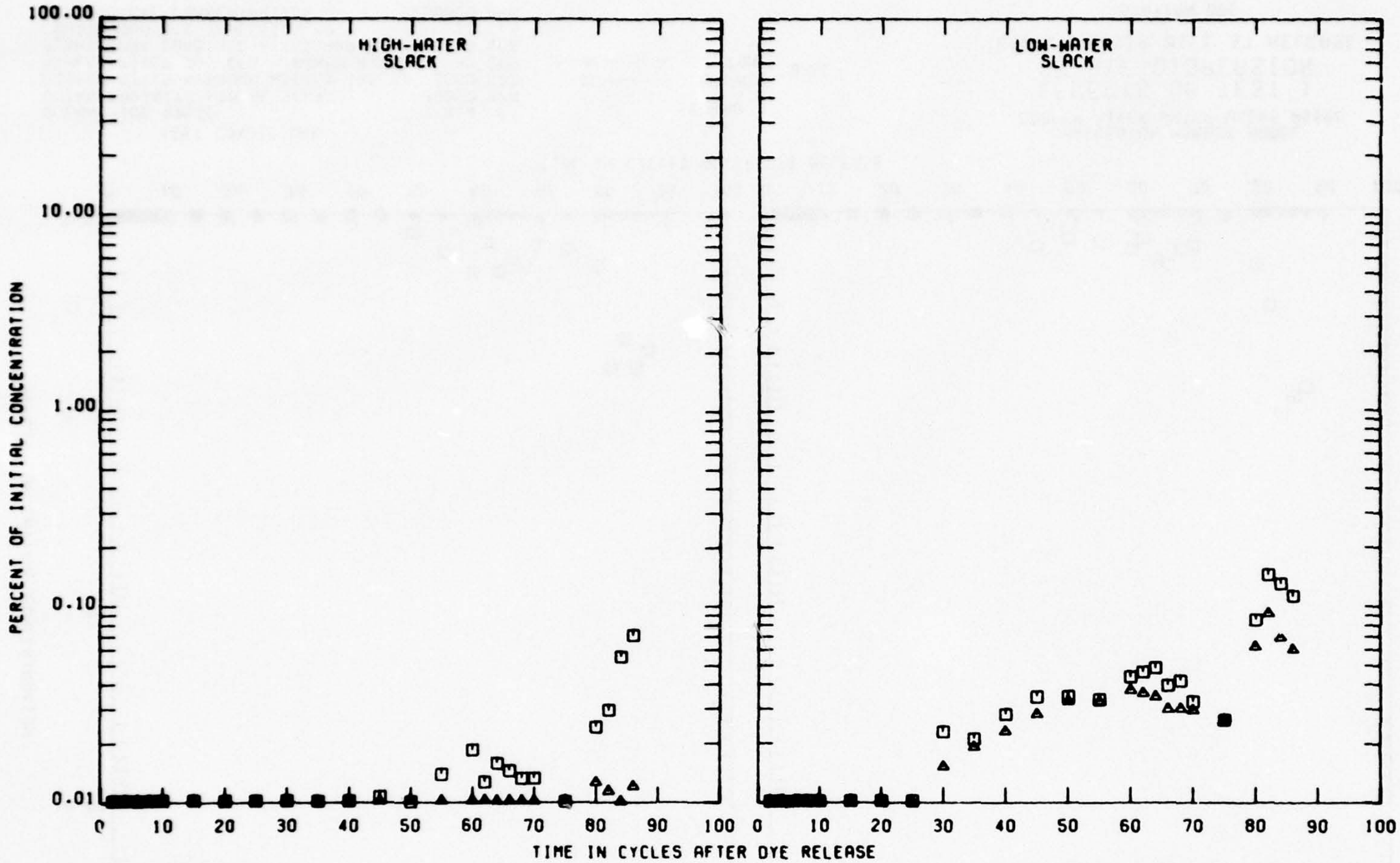
CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 1
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION 00C

PLATE 3



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

□ ——— SURFACE
△ — — — BOTTOM
BASE

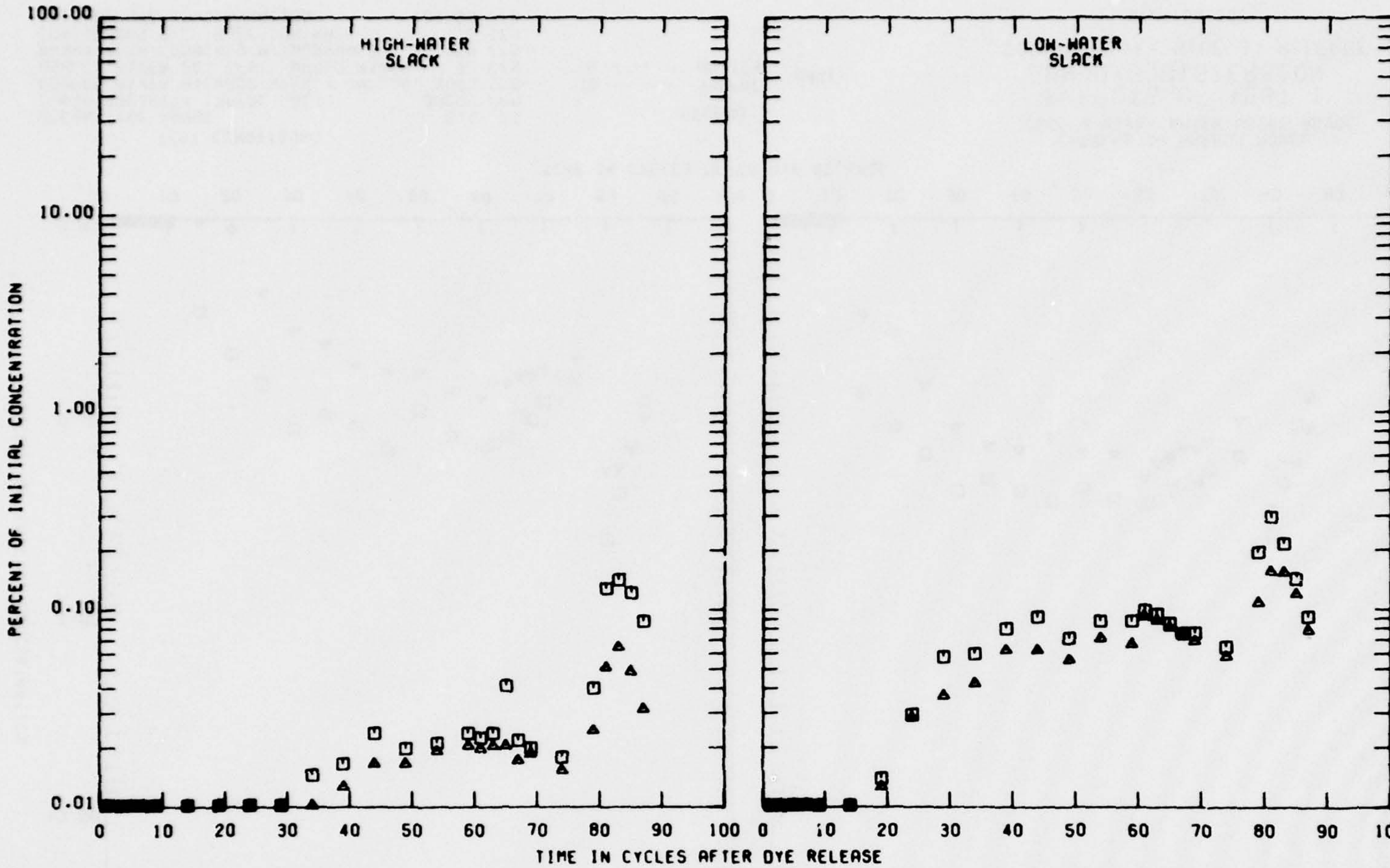
CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 1
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION OSC

PLATE 4



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
RUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

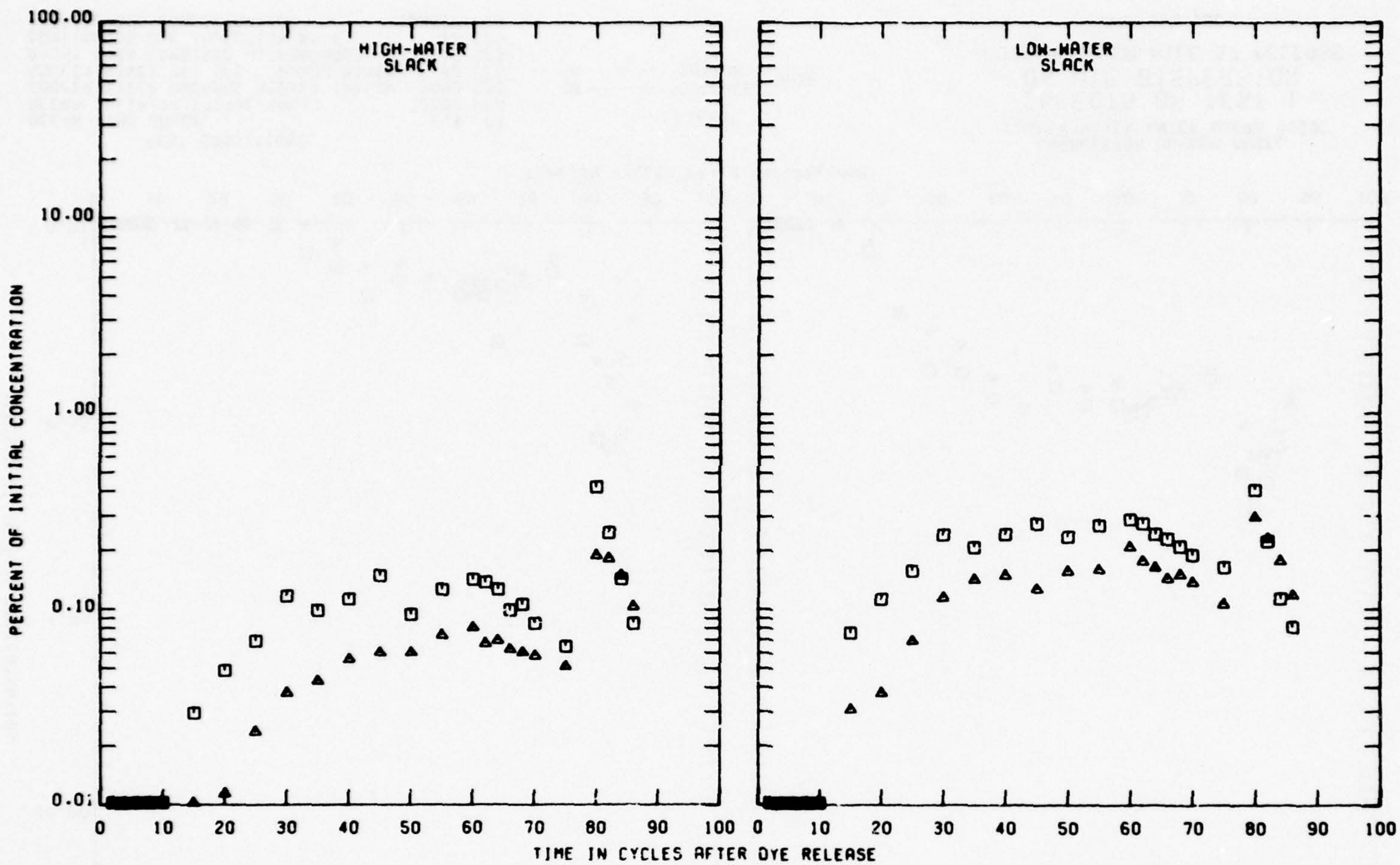
□ ——— SURFACE
△ -- — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 1
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION 10C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

□ ——— SURFACE
△ — — — BOTTOM
BASE

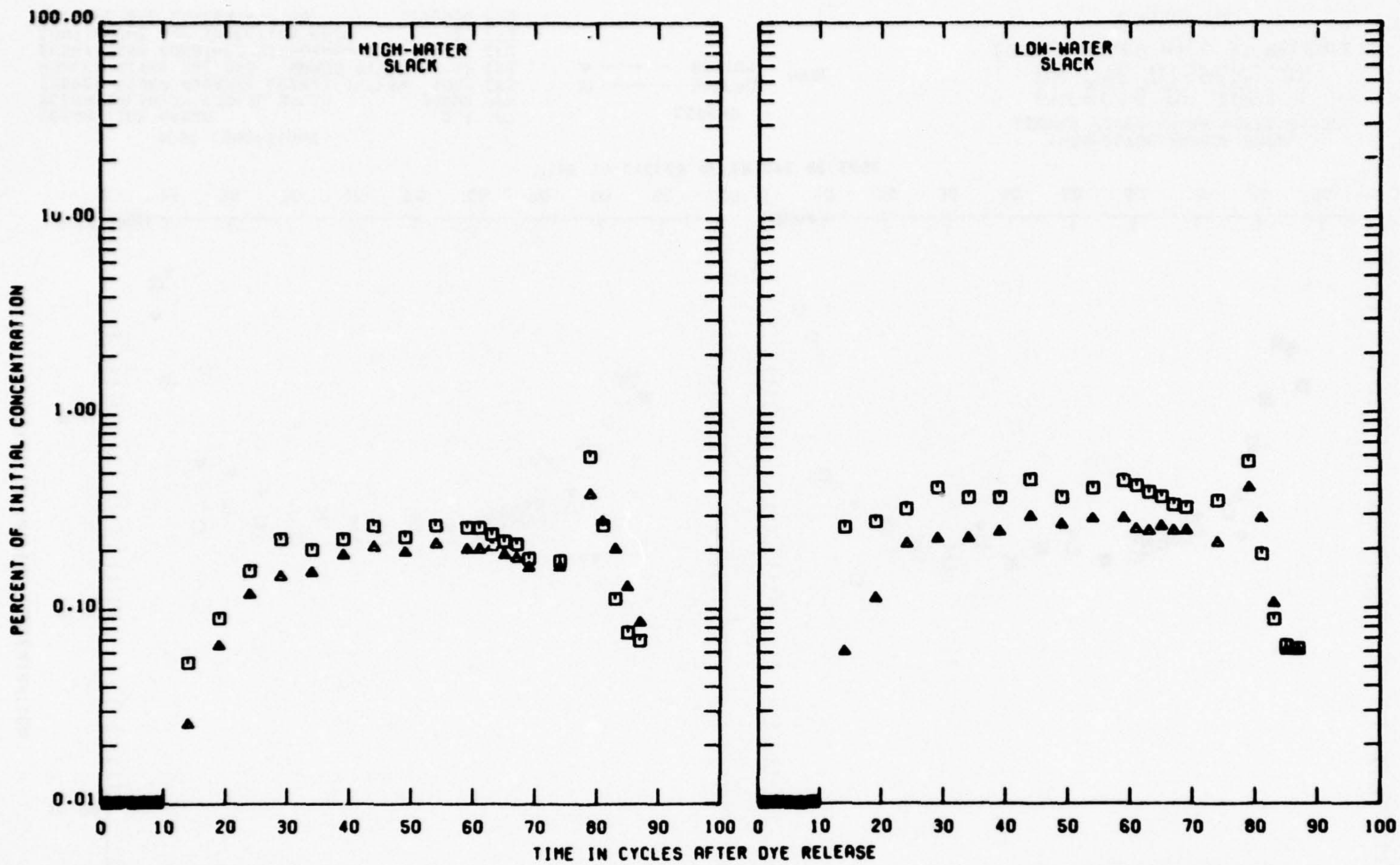
CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 1
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION 15C

PLATE 6



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

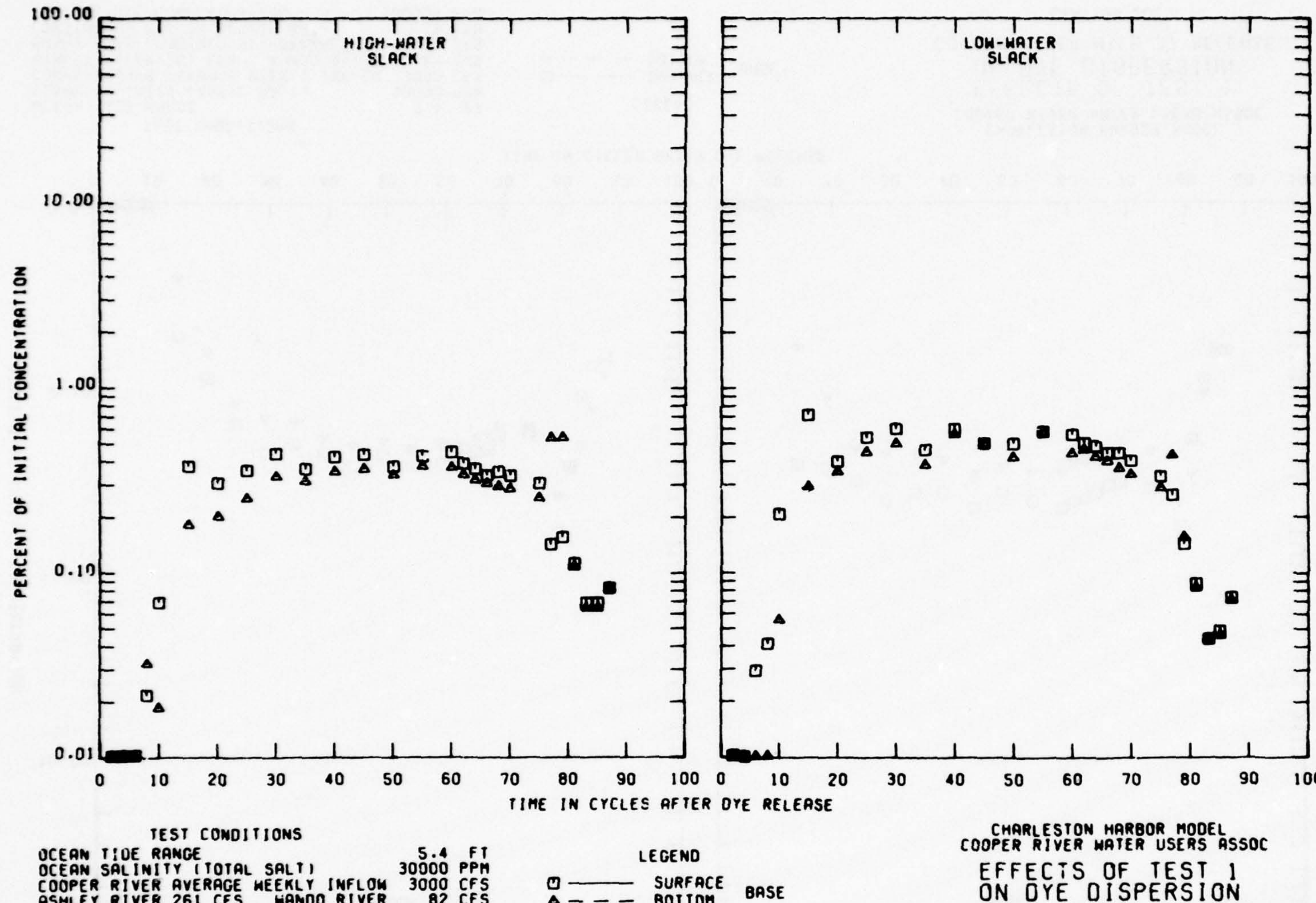
LEGEND

BASE: SURFACE (squares, solid line); BOTTOM (triangles, dashed line)

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 1
ON DYE DISPERSION
COOPER RIVER MILE 37 RELEASE

STATION 20C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

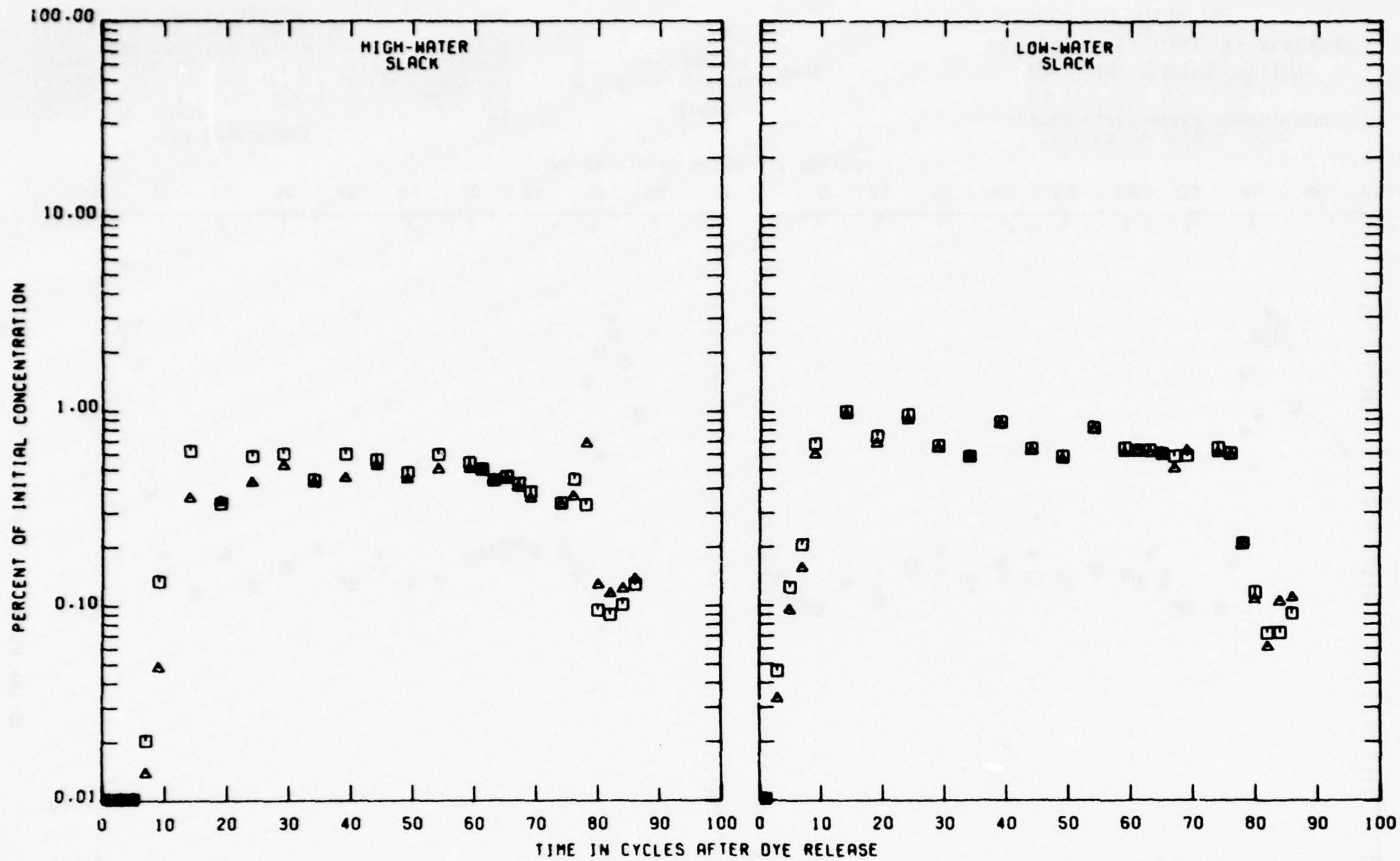
CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 1
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION 25C

PLATE 8



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
CONTINUOUS DYE INJECTION RATE	15	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

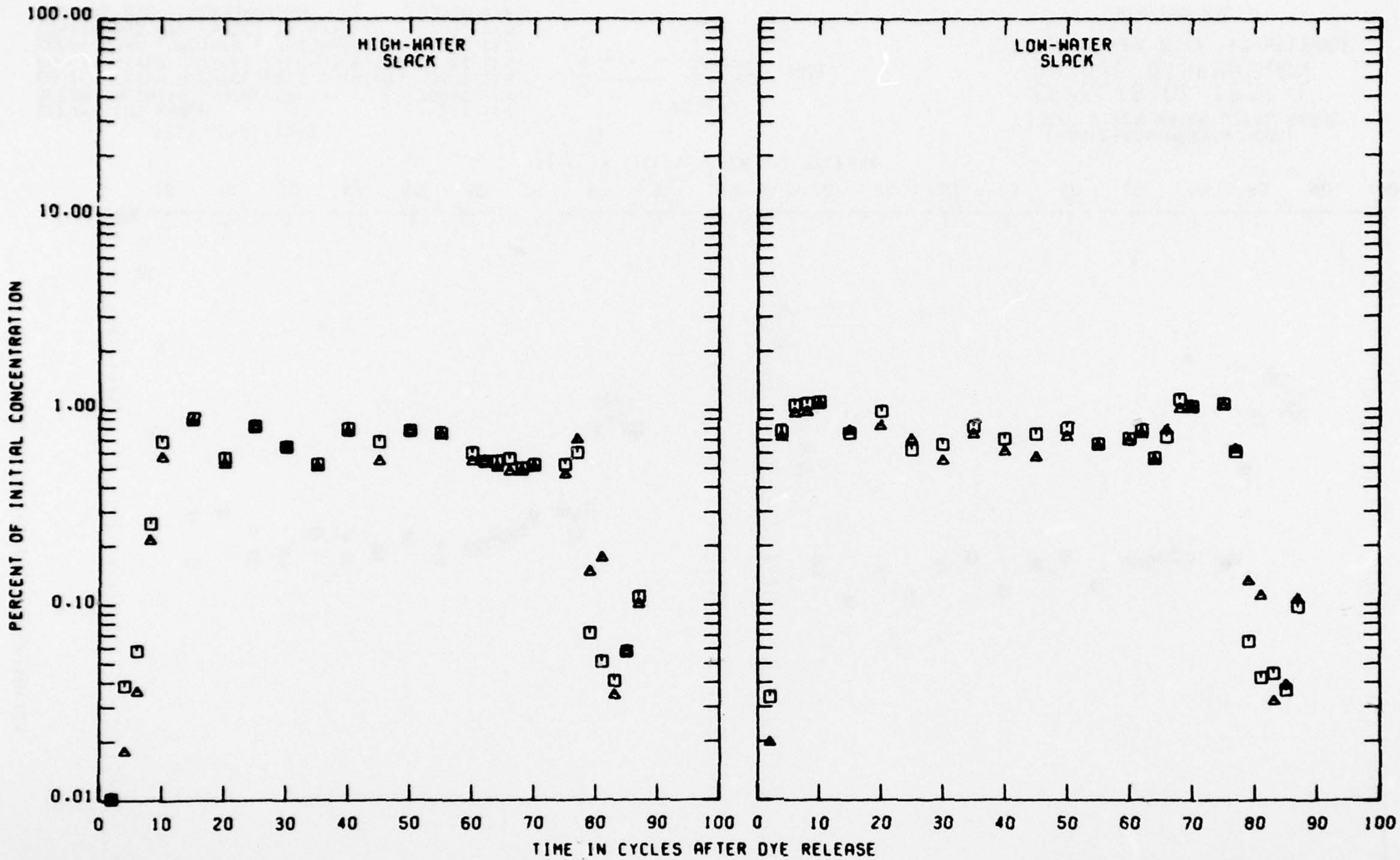
□ ——— SURFACE
△ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 1
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION 29C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

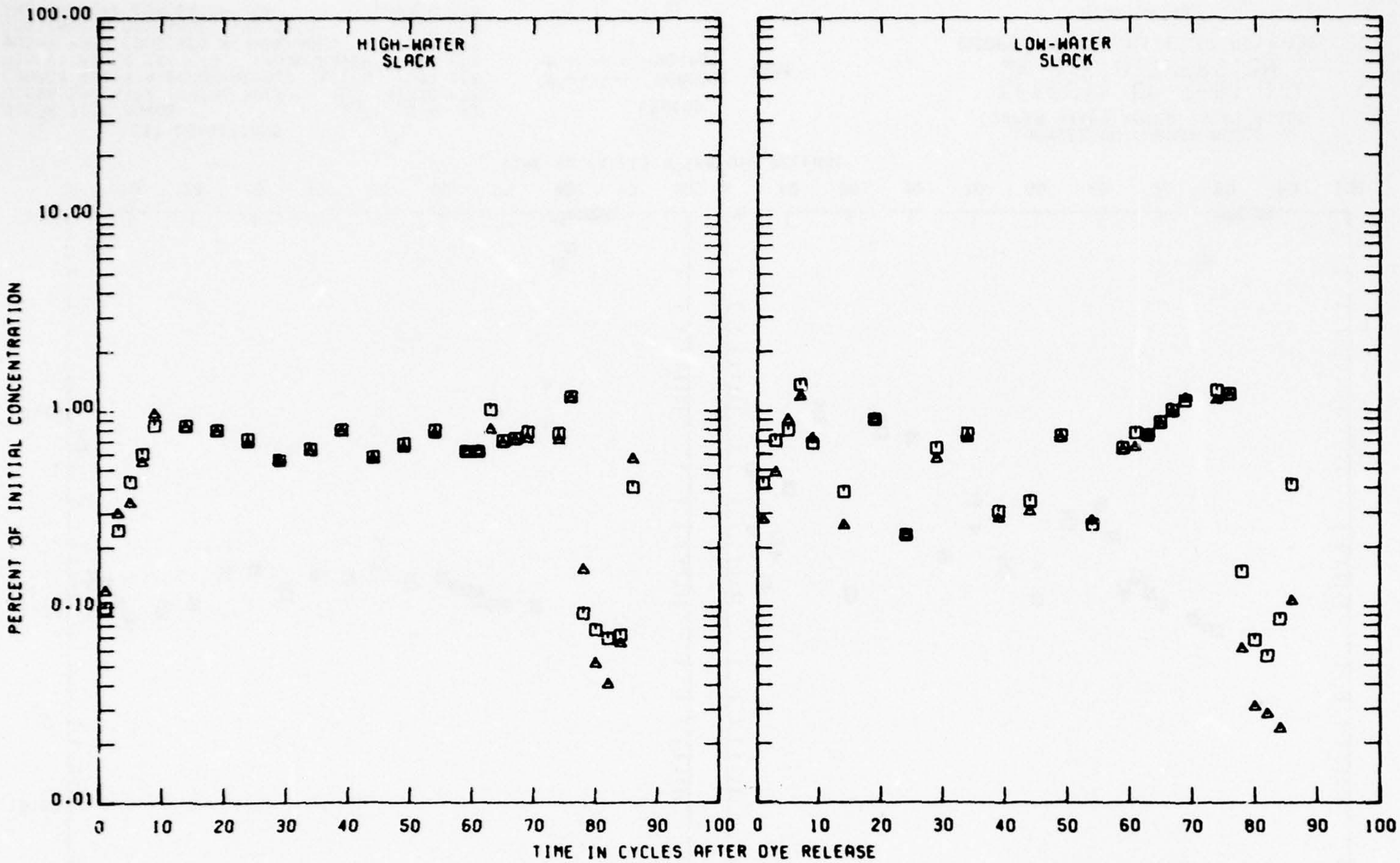
□ ——— SURFACE
△ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 1
ON DYE DISPERSION
COOPER RIVER MILE 37 RELEASE

STATION 33C

PLATE 10



TEST CONDITIONS	
OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

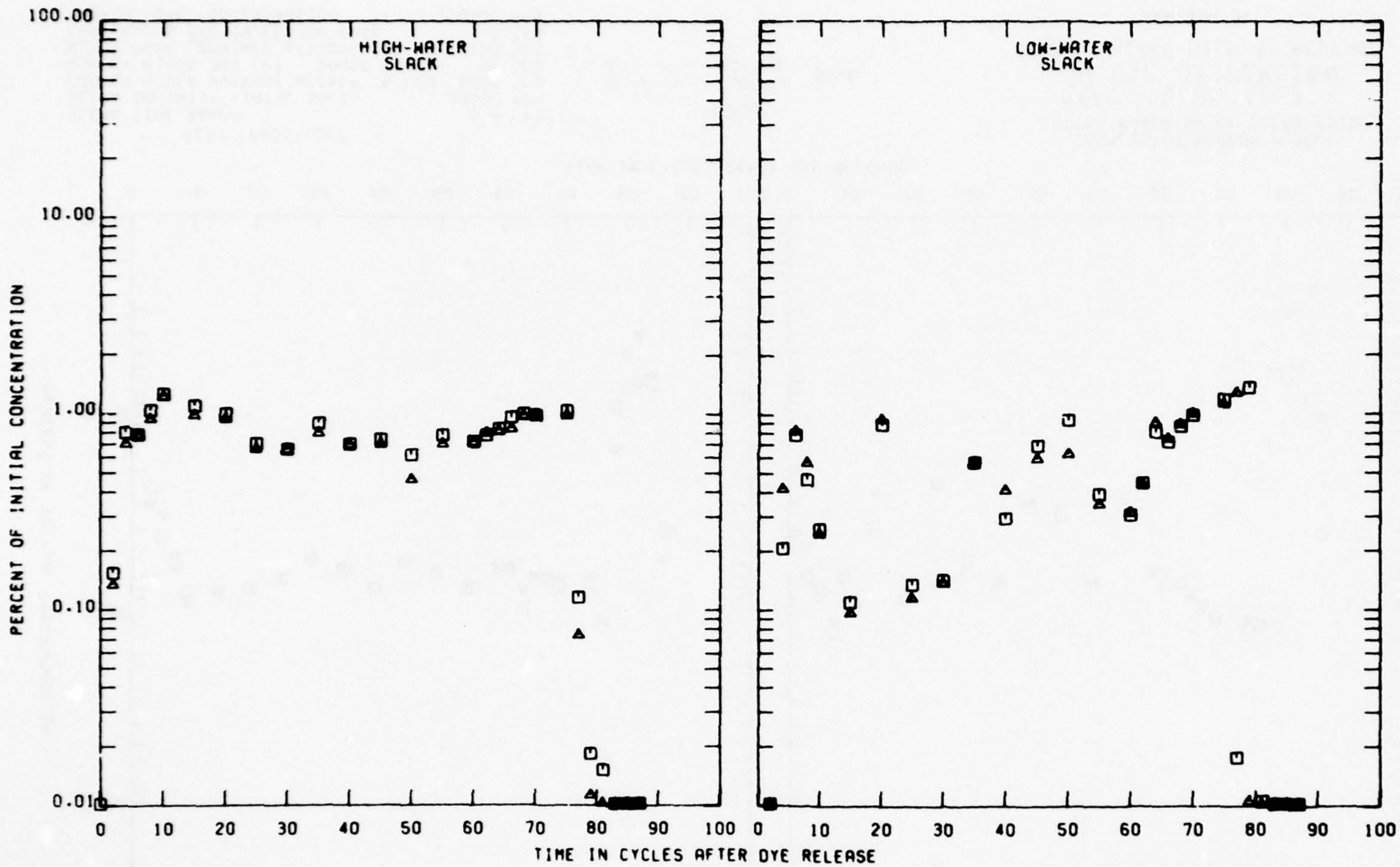
□ ——— SURFACE BASE
△ — — — BOTTOM

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 1
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION 36C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
CONTINUOUS DYE INJECTION RATE	15	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

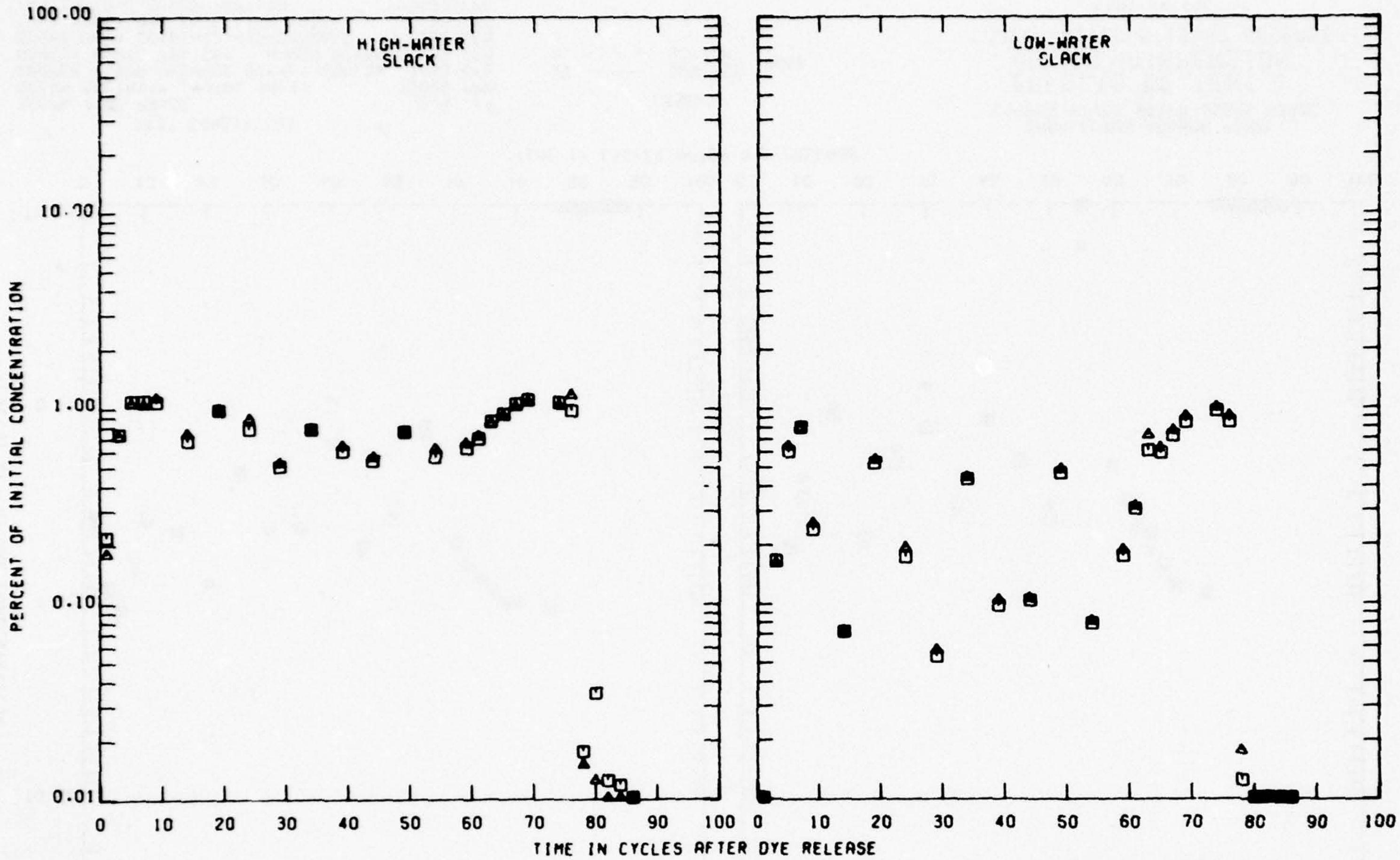
□ ——— SURFACE
△ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 1
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION 38C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

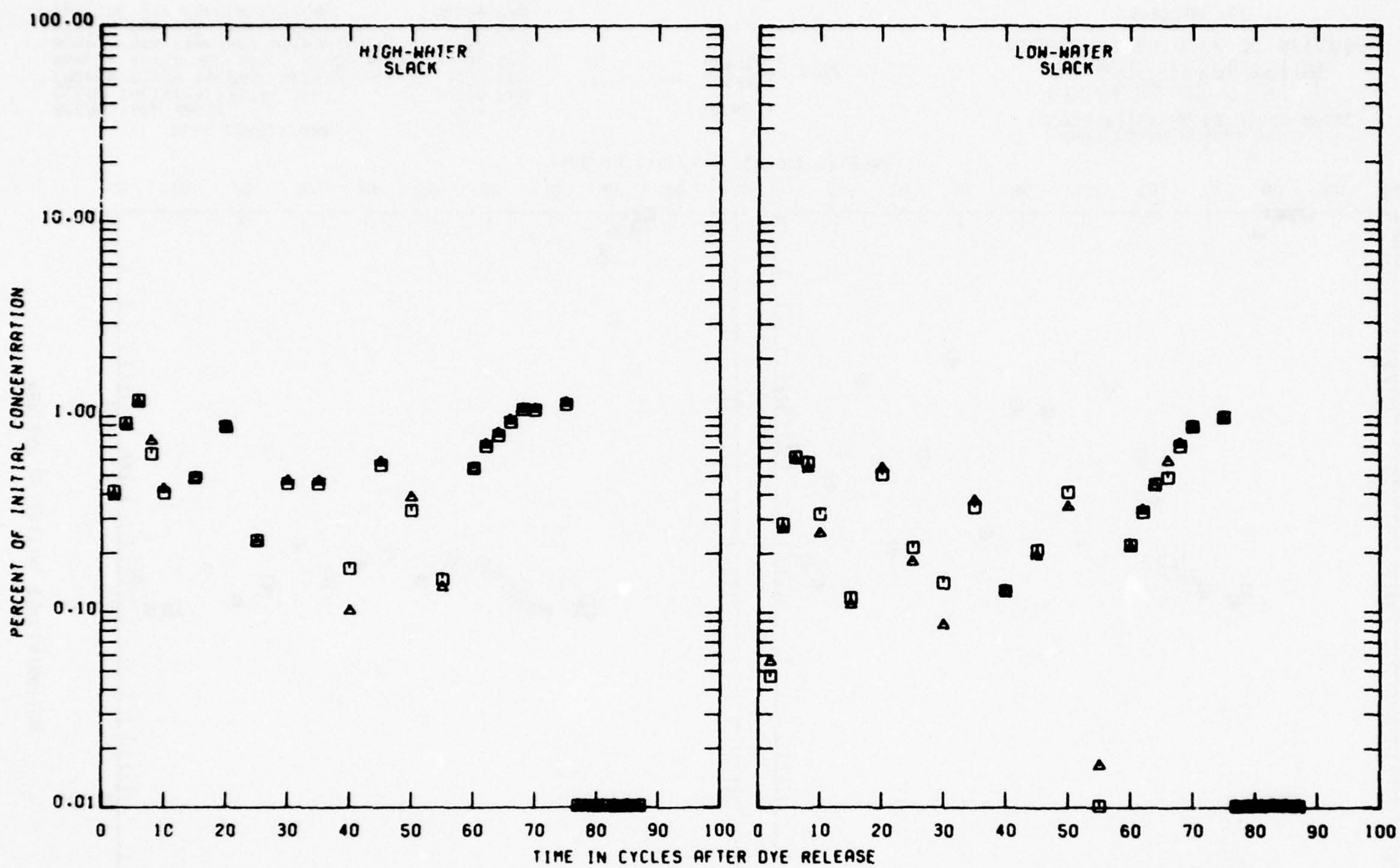
□ ——— SURFACE
△ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 1
ON DYE DISPERSION
COOPER RIVER MILE 37 RELEASE

STATION TEE

PLATE 13



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

□ ——— SURFACE BASE
△ – – – BOTTOM

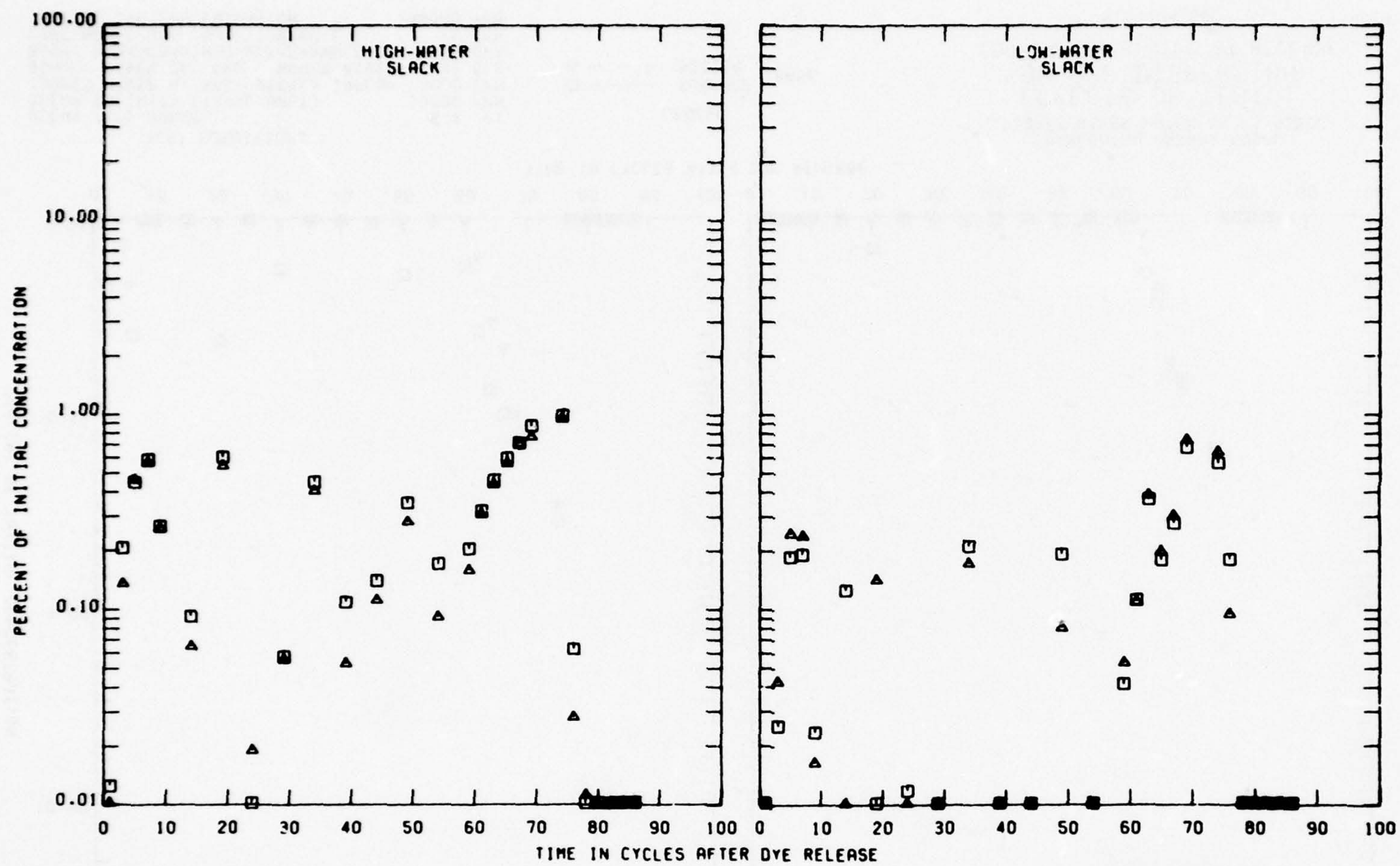
CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 1
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION 43C

PLATE 14



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

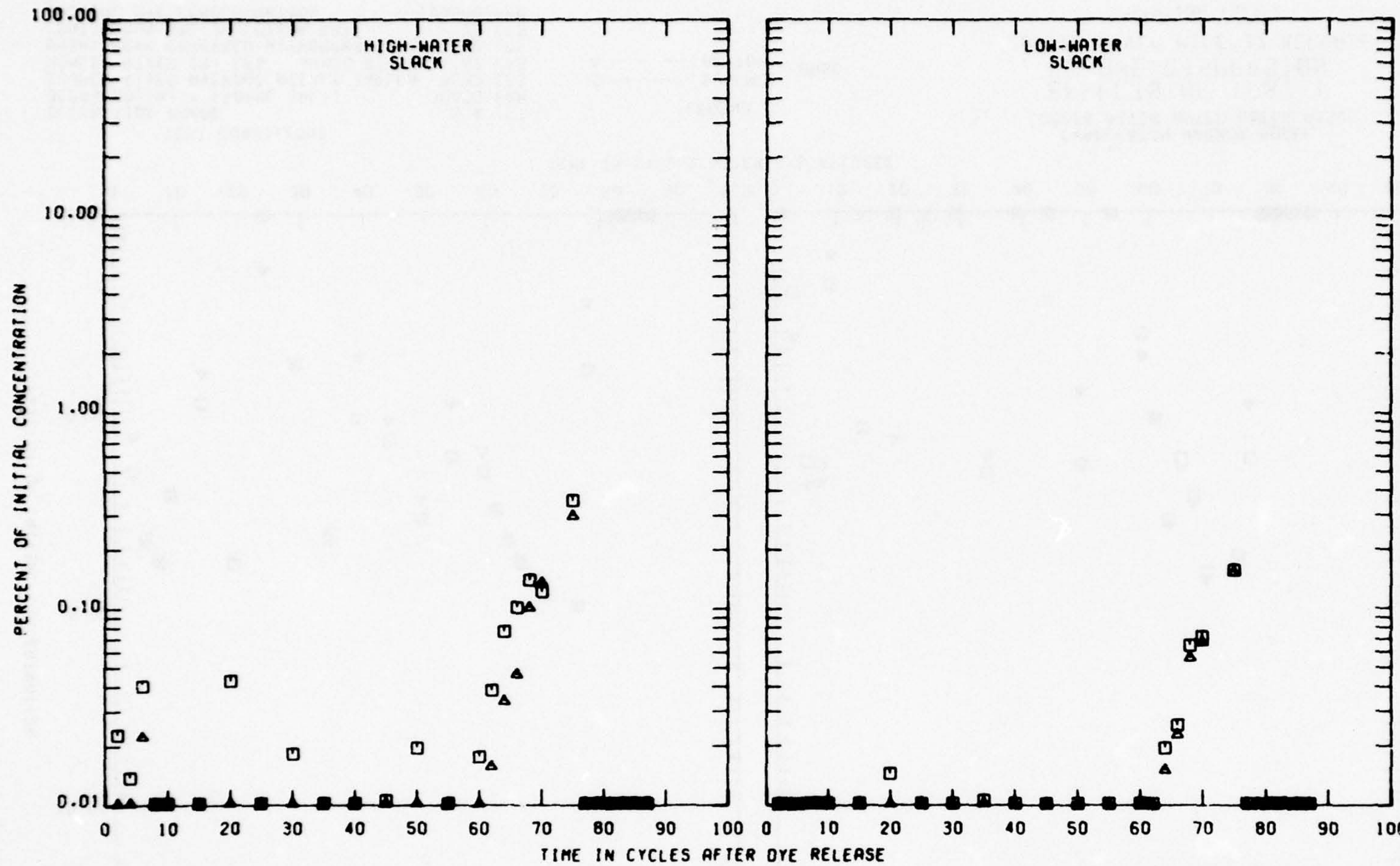
LEGEND

□ ——— SURFACE
△ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 1
ON DYE DISPERSION
COOPER RIVER MILE 37 RELEASE

STATION 45C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

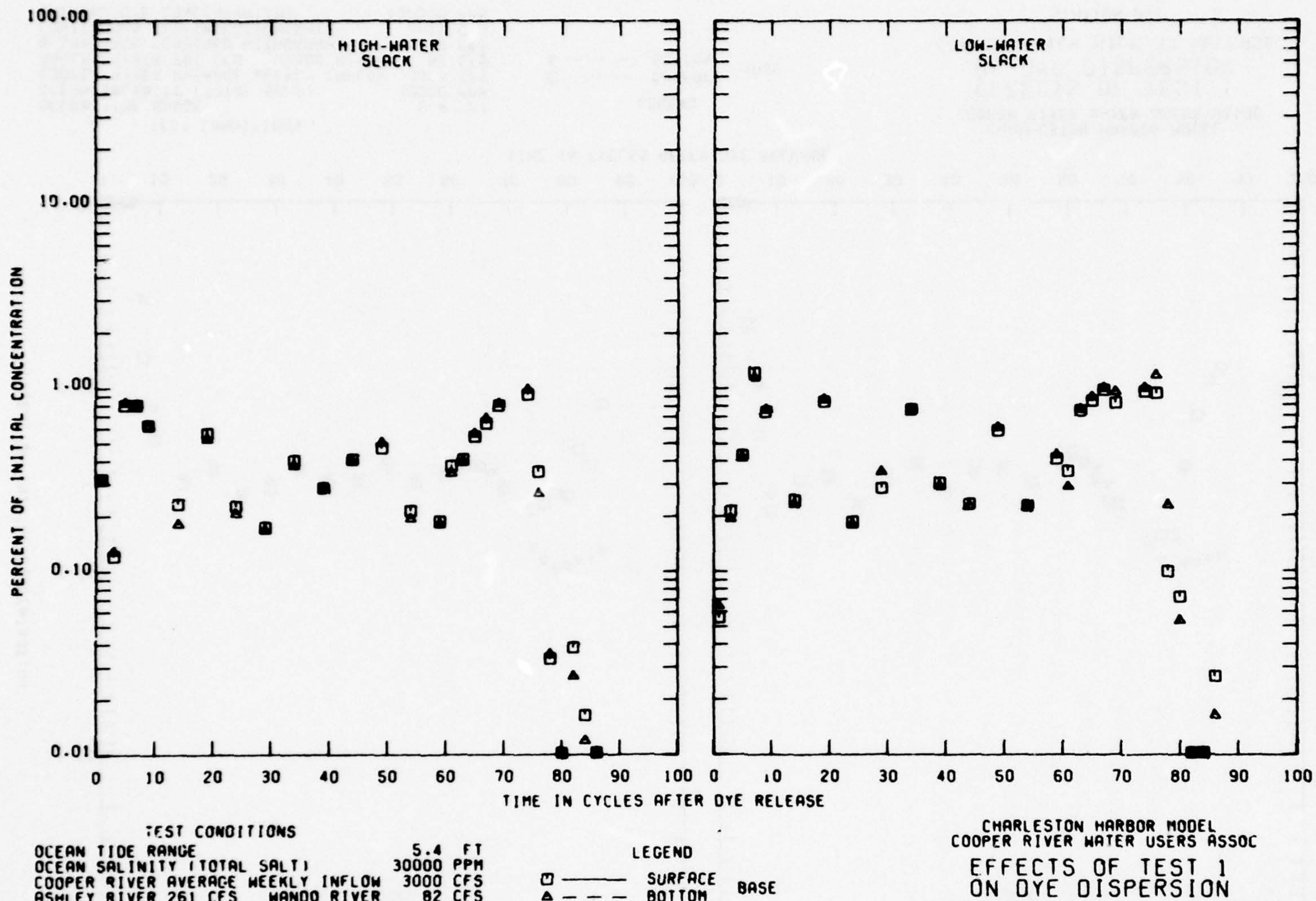
CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 1
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION 50C

PLATE 16



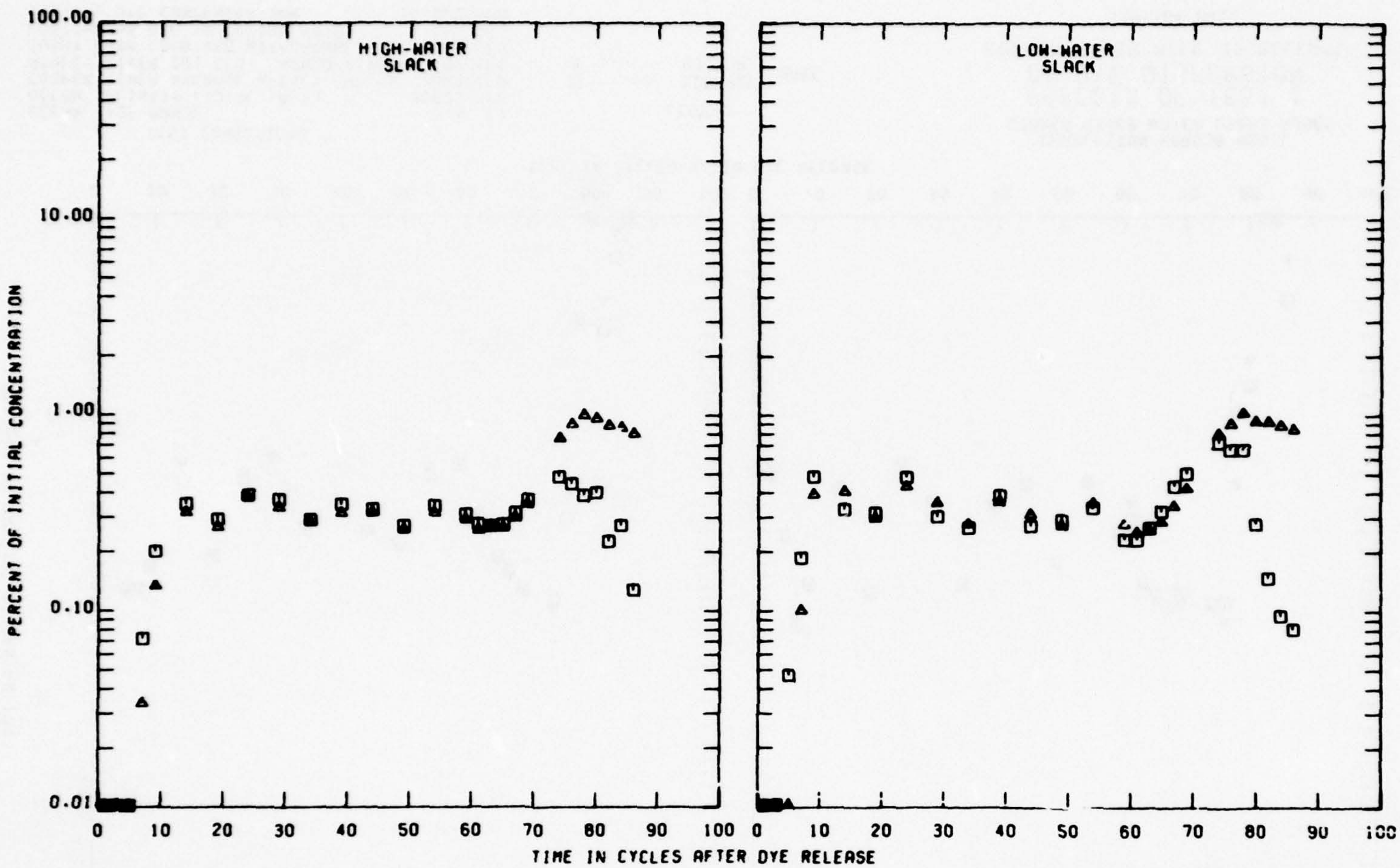
TEST CONDITIONS	
OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 1
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION BRC



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

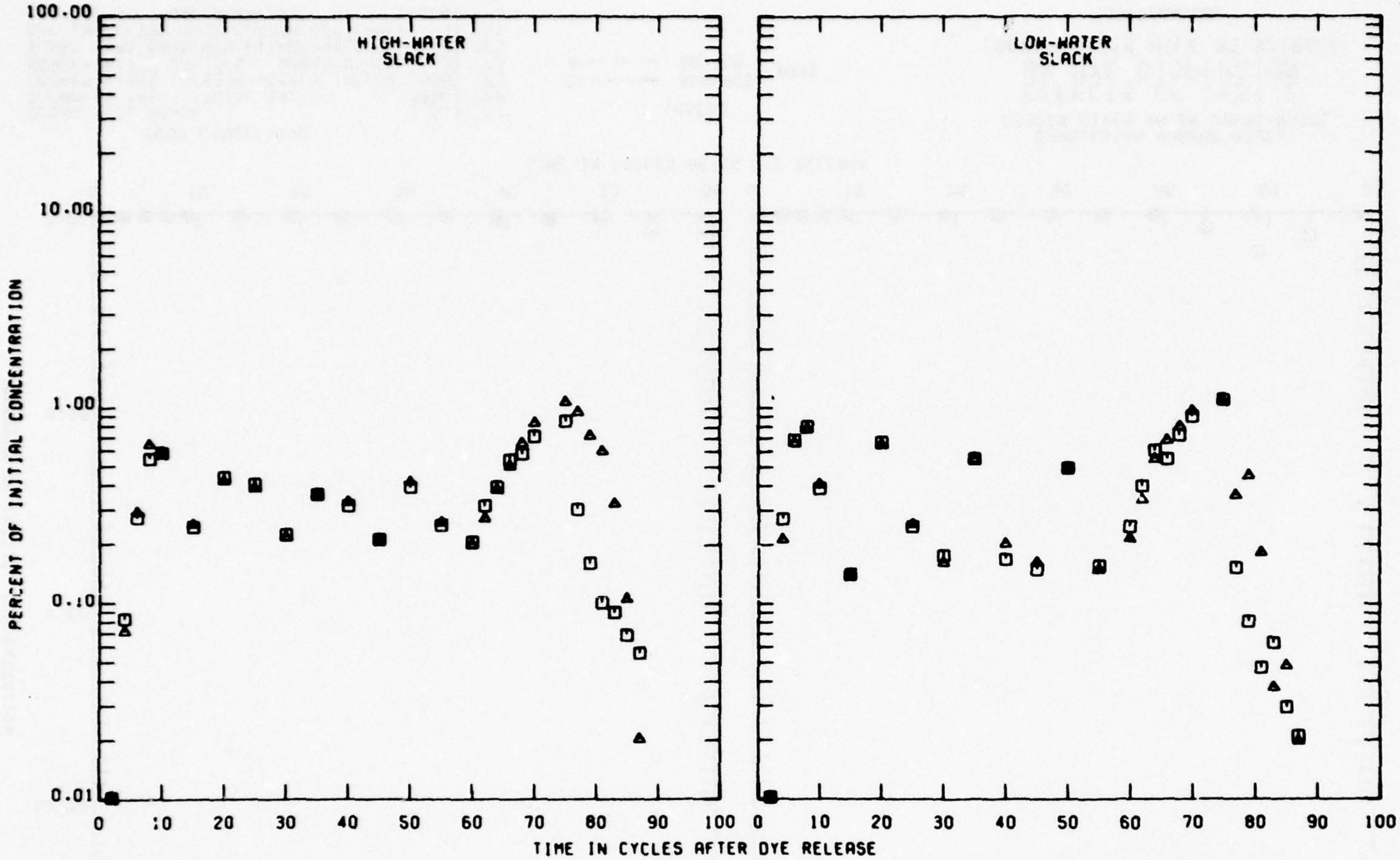
□ ——— SURFACE
△ – – – BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 1
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION BR1



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

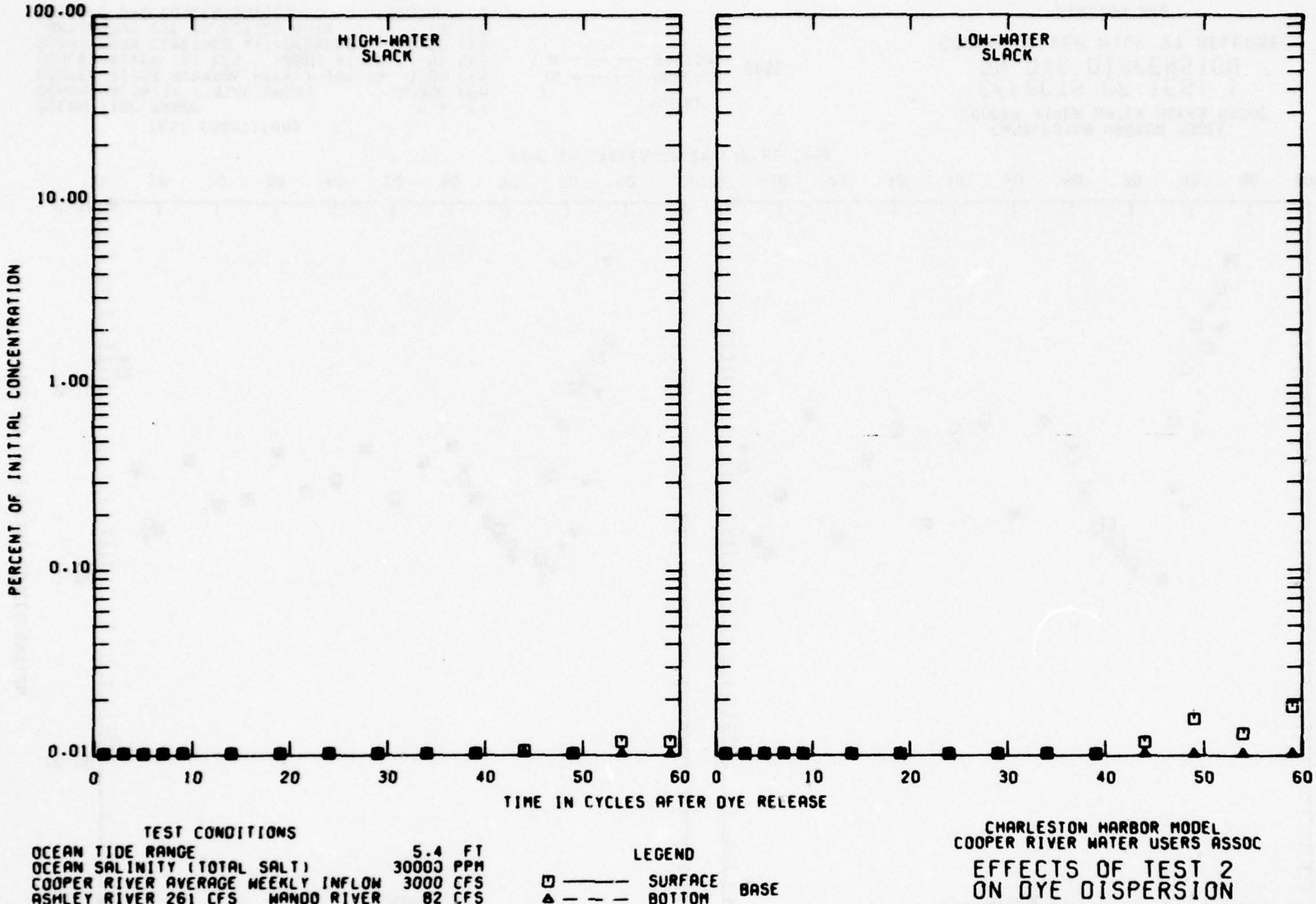
□ ——— SURFACE
△ – – – BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 1
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION BR2



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
DYE INJECTION RATE DURING EBB PHASE	30	CFS
INITIAL DYE CONCENTRATION	100000	PPB

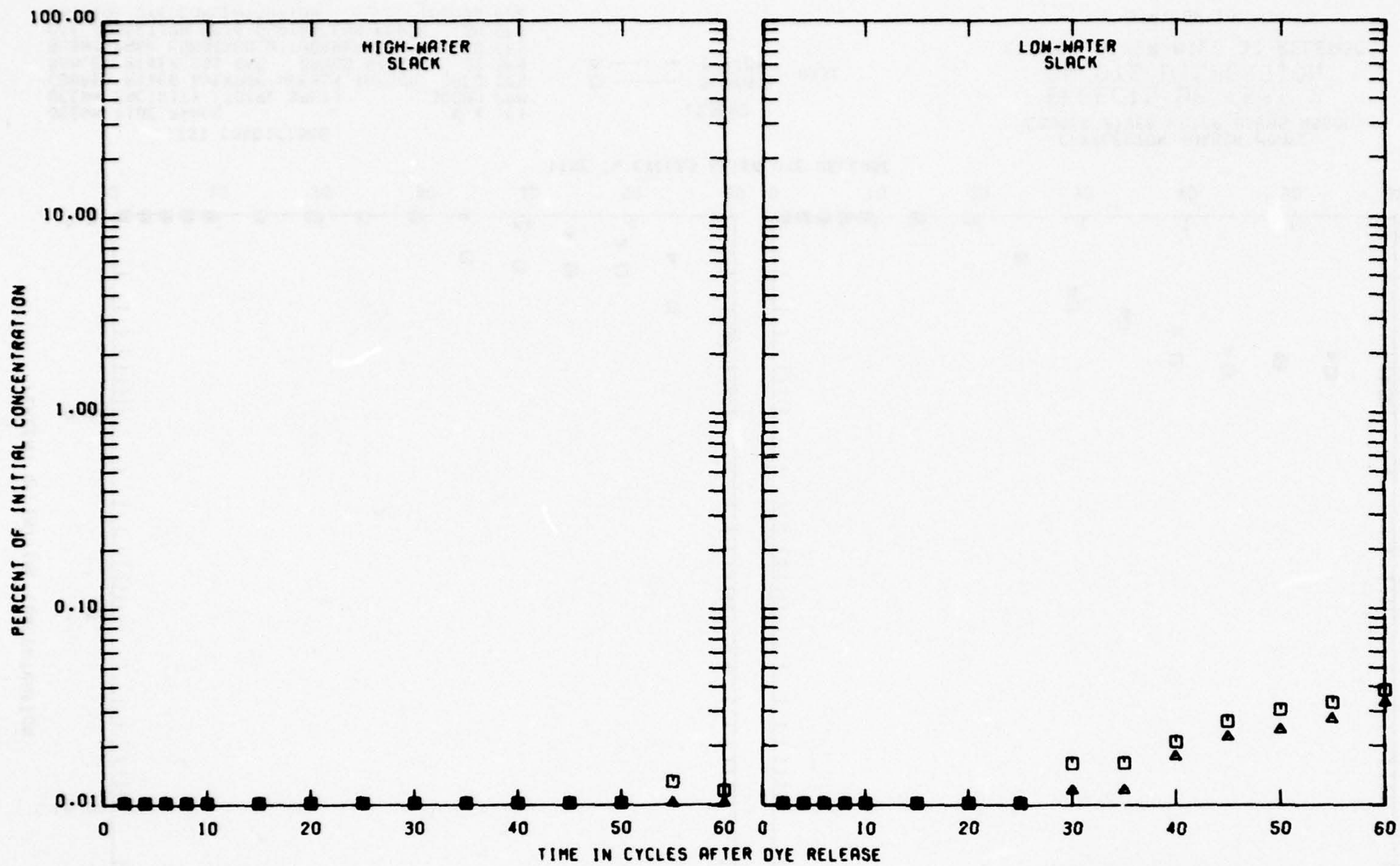
CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 2
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION OOC

PLATE 20



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
DYE INJECTION RATE DURING EBB PHASE	30	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

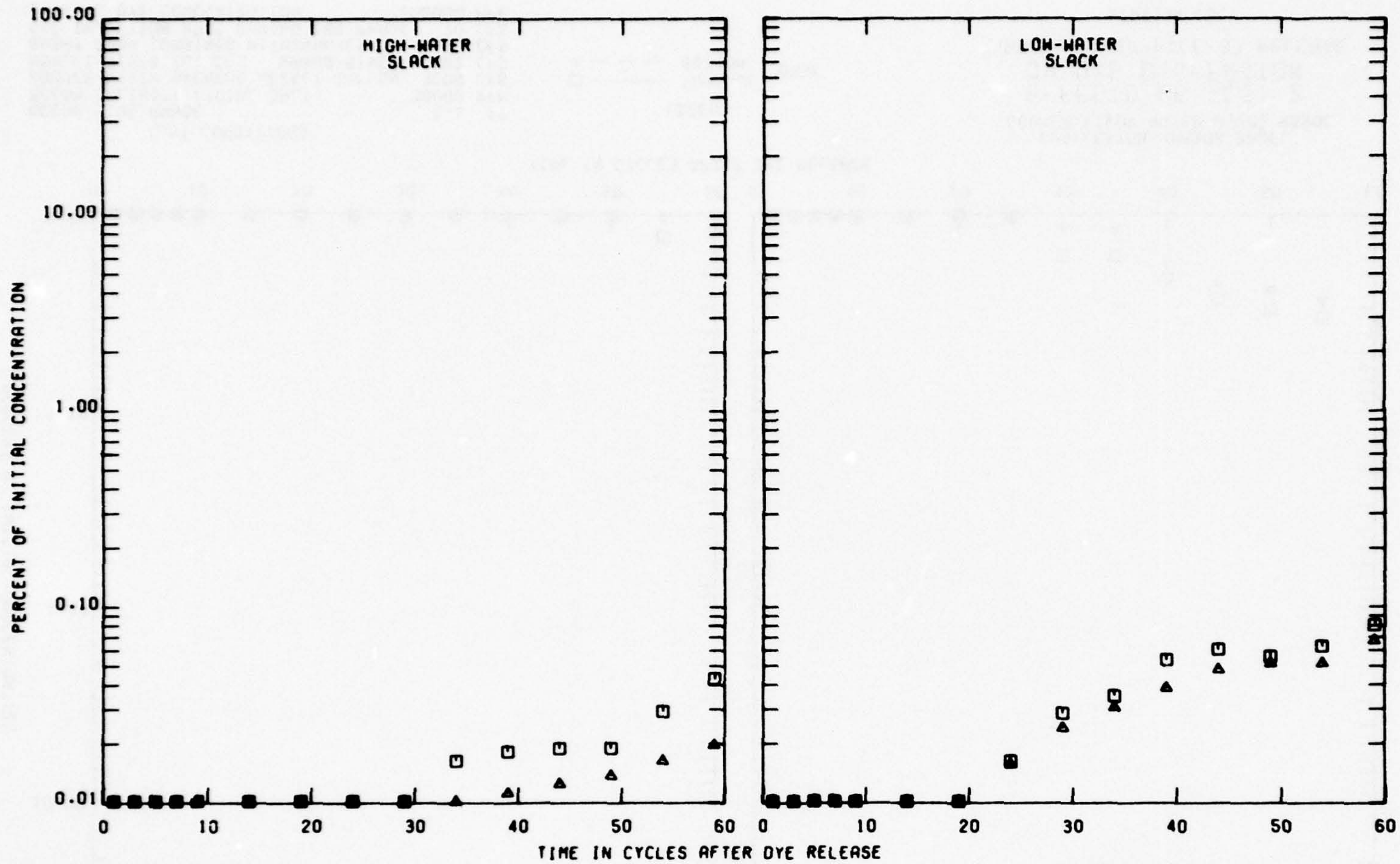
□ ——— SURFACE
△ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 2
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION 05C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
DYE INJECTION RATE DURING EBB PHASE	30	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

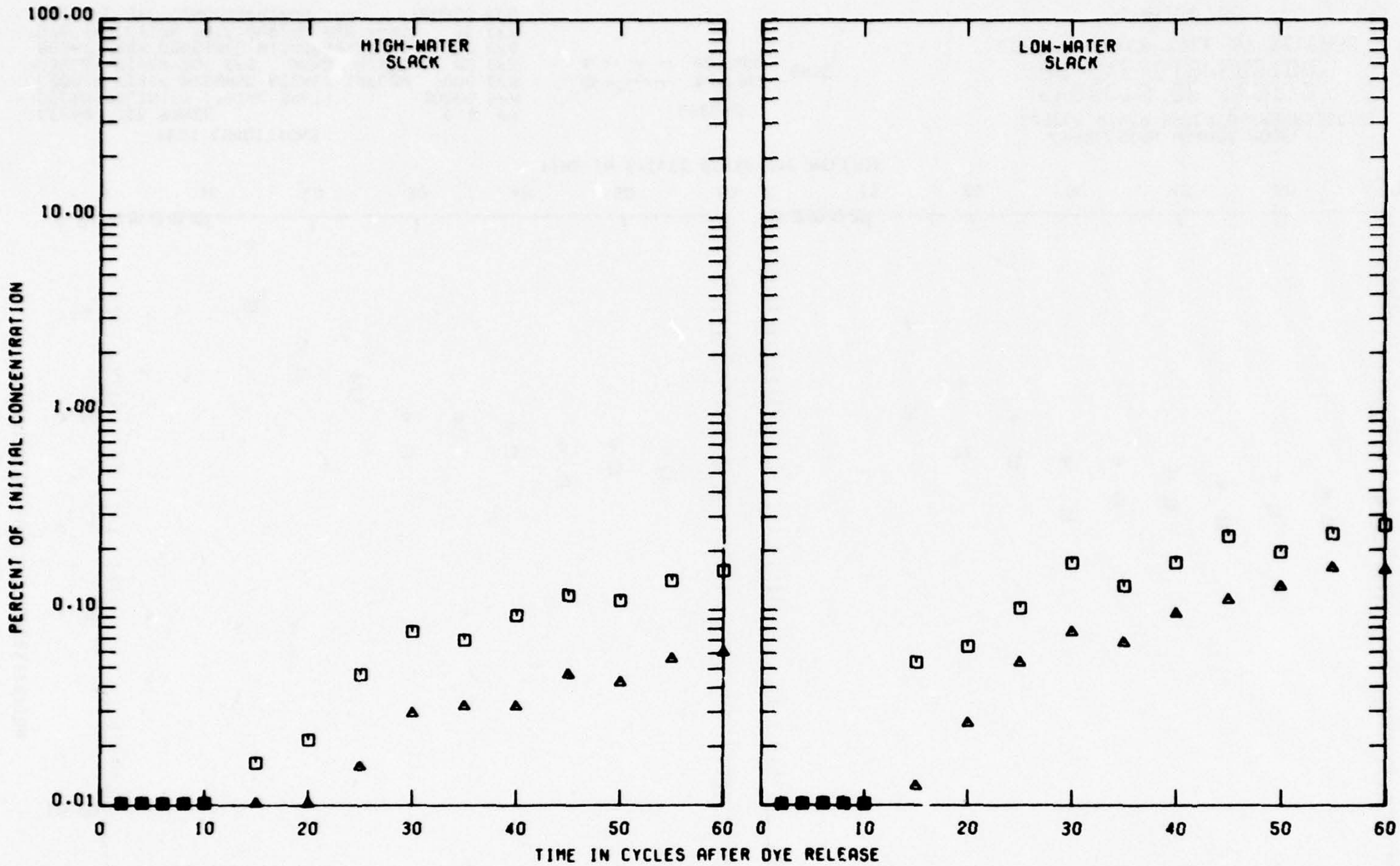
□ ——— SURFACE
△ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 2
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION 10C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
DYE INJECTION RATE DURING EBB PHASE	30 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

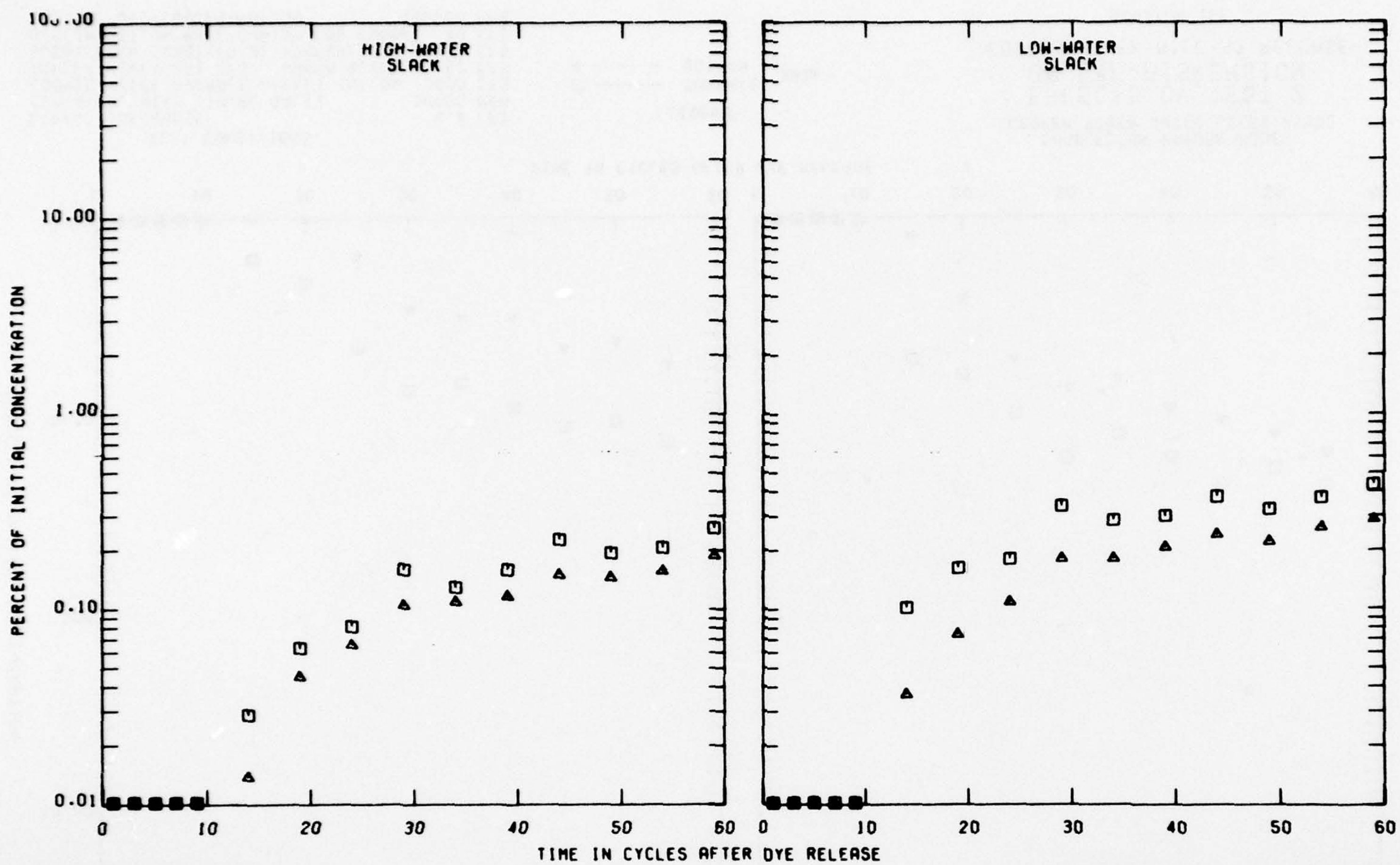
□ ——— SURFACE
△ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 2
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION 15C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
DYE INJECTION RATE DURING EBB PHASE	30	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

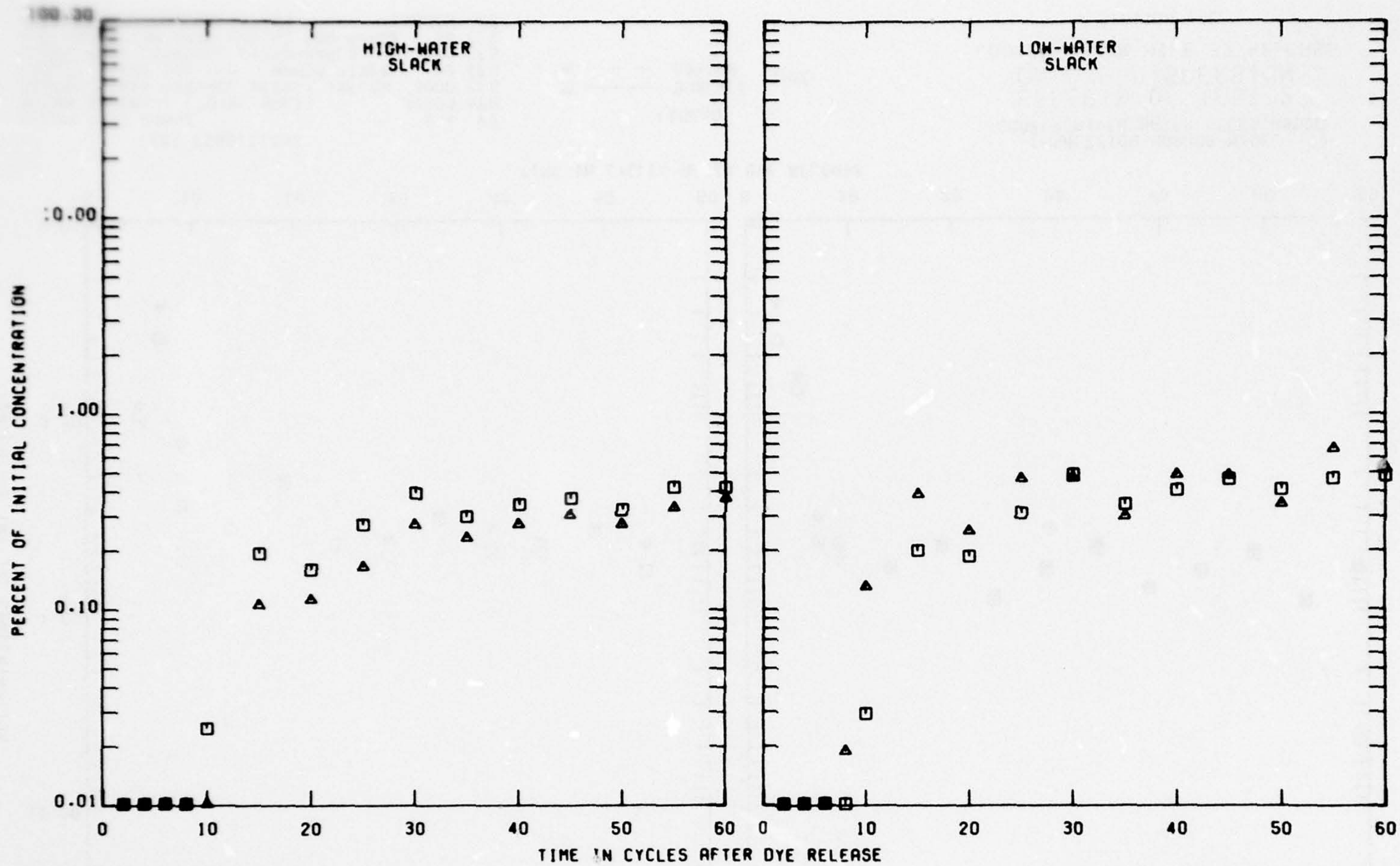
□ ——— SURFACE BASE
△ — — — BOTTOM

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 2
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION 20C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
DYE INJECTION RATE DURING EBB PHASE	30	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

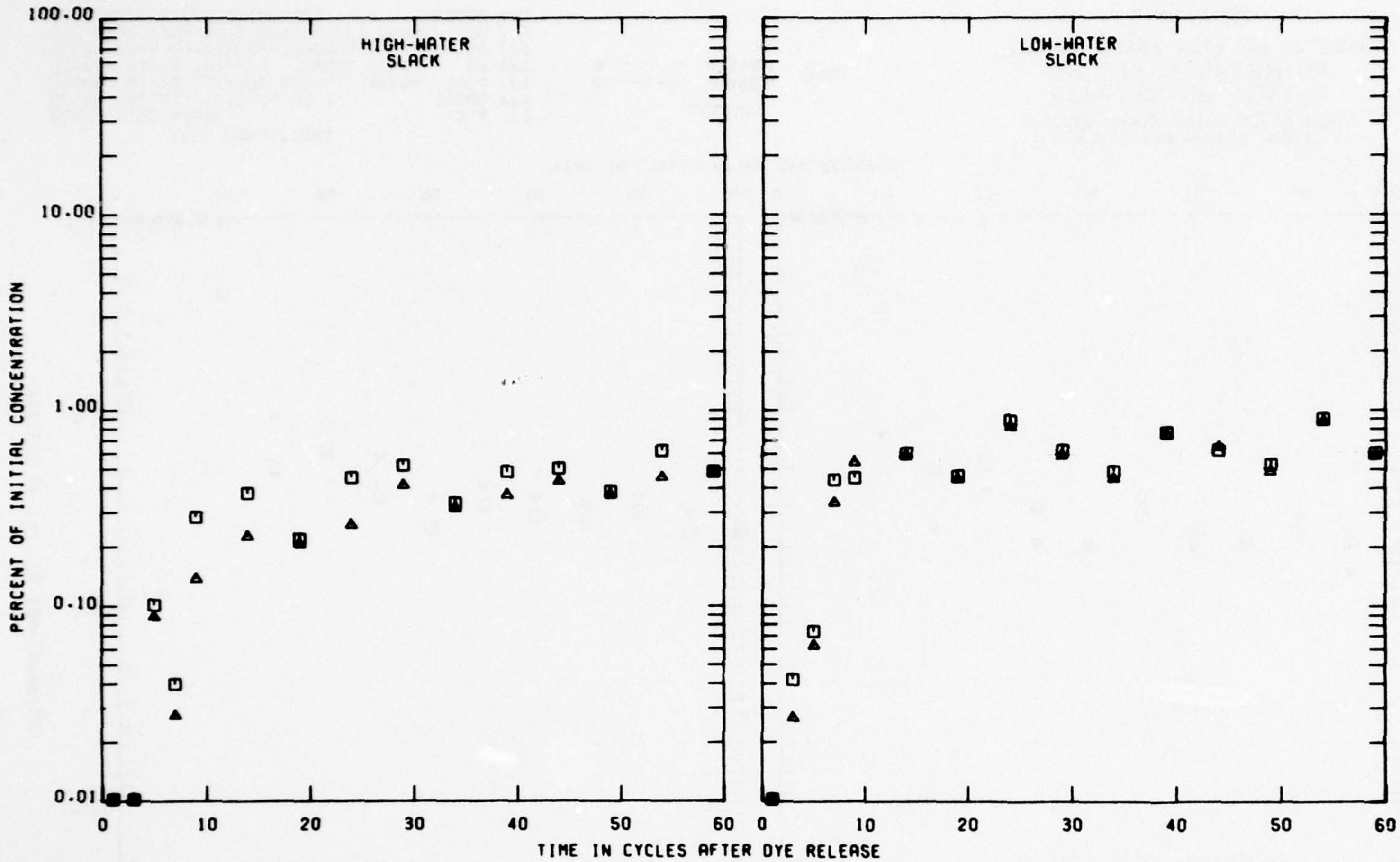
□ ——— SURFACE BASE
△ — — — BOTTOM

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 2
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION 25C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
DYE INJECTION RATE DURING EBB PHASE	30	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

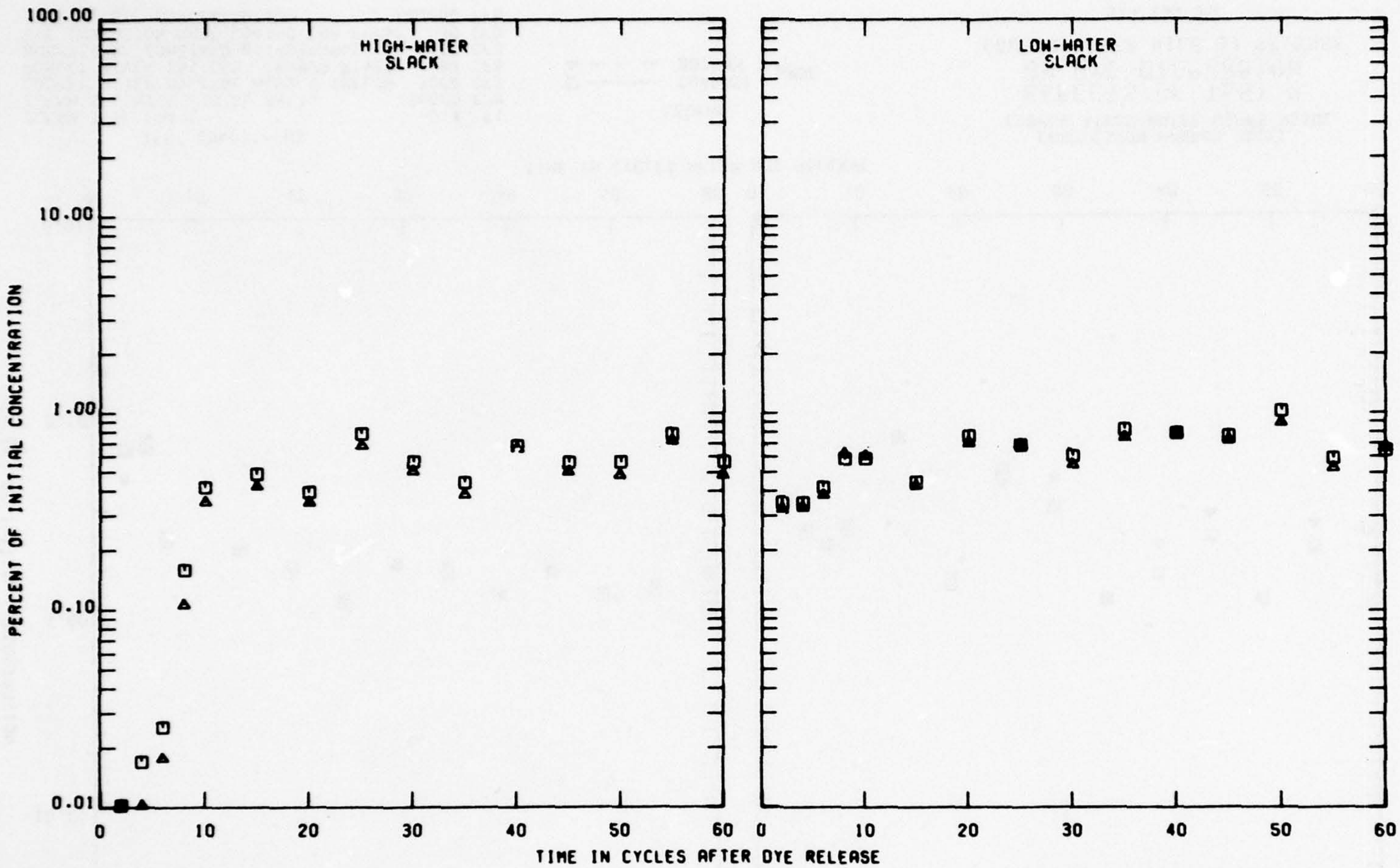
□ ——— SURFACE
△ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 2
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION 29C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
DYE INJECTION RATE DURING EBB PHASE	30	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

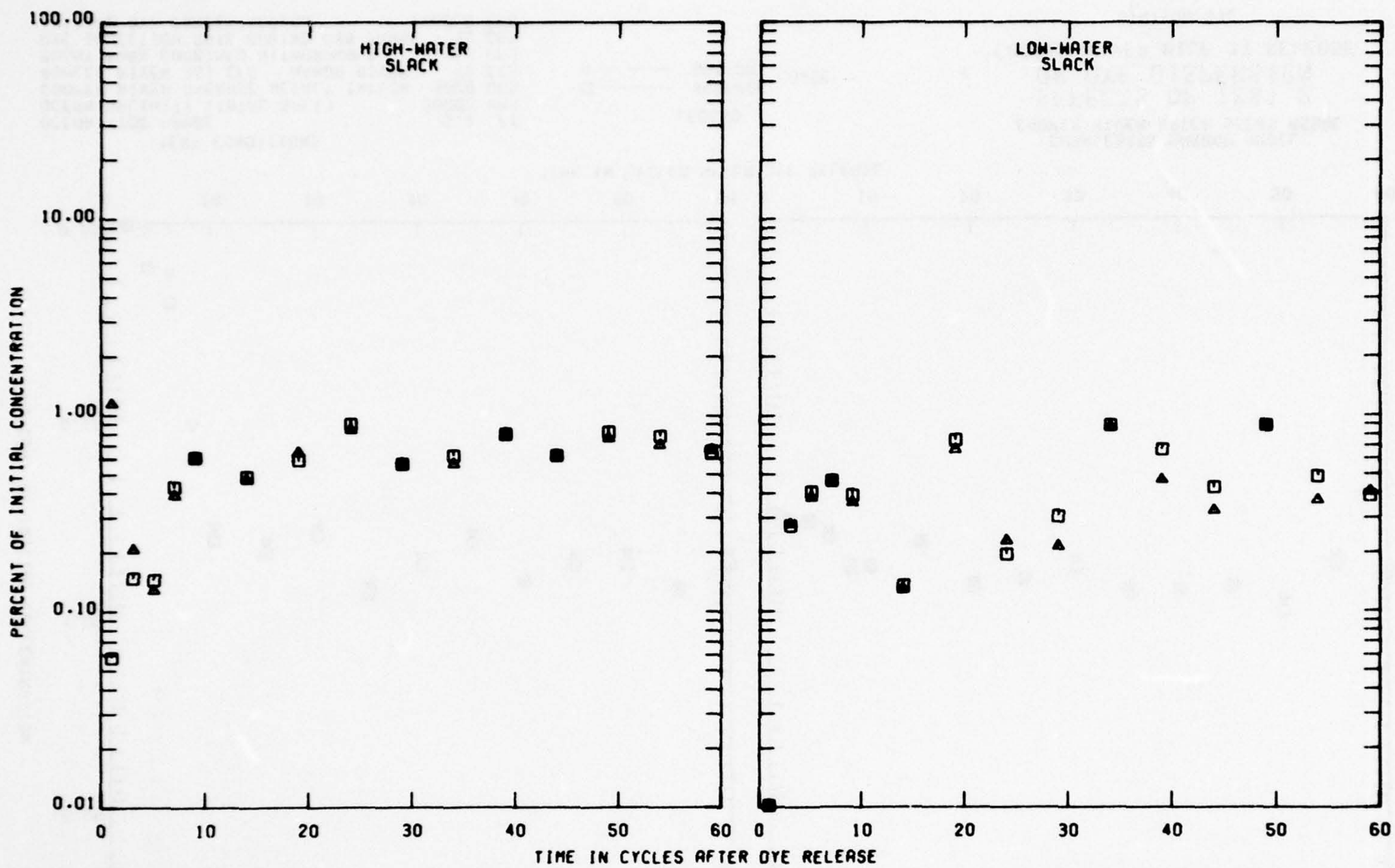
□ ——— SURFACE
▲ – – – BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 2
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION 33C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
DYE INJECTION RATE DURING EBB PHASE	30 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

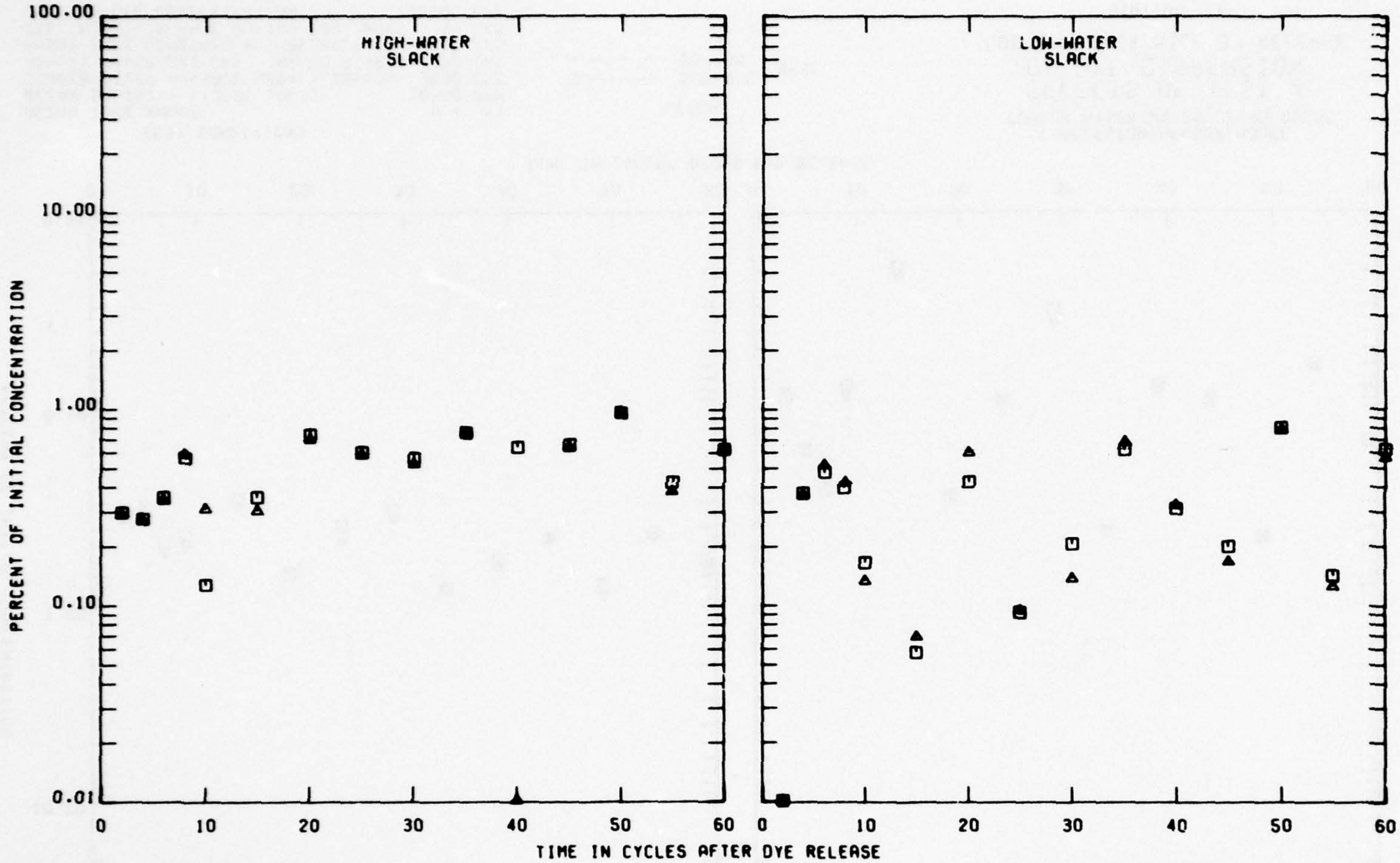
□ ——— SURFACE
▲ – – – BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 2
ON DYE DISPERSION
COOPER RIVER MILE 37 RELEASE

STATION 36C

PLATE 28



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
DYE INJECTION RATE DURING EBB PHASE	30	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

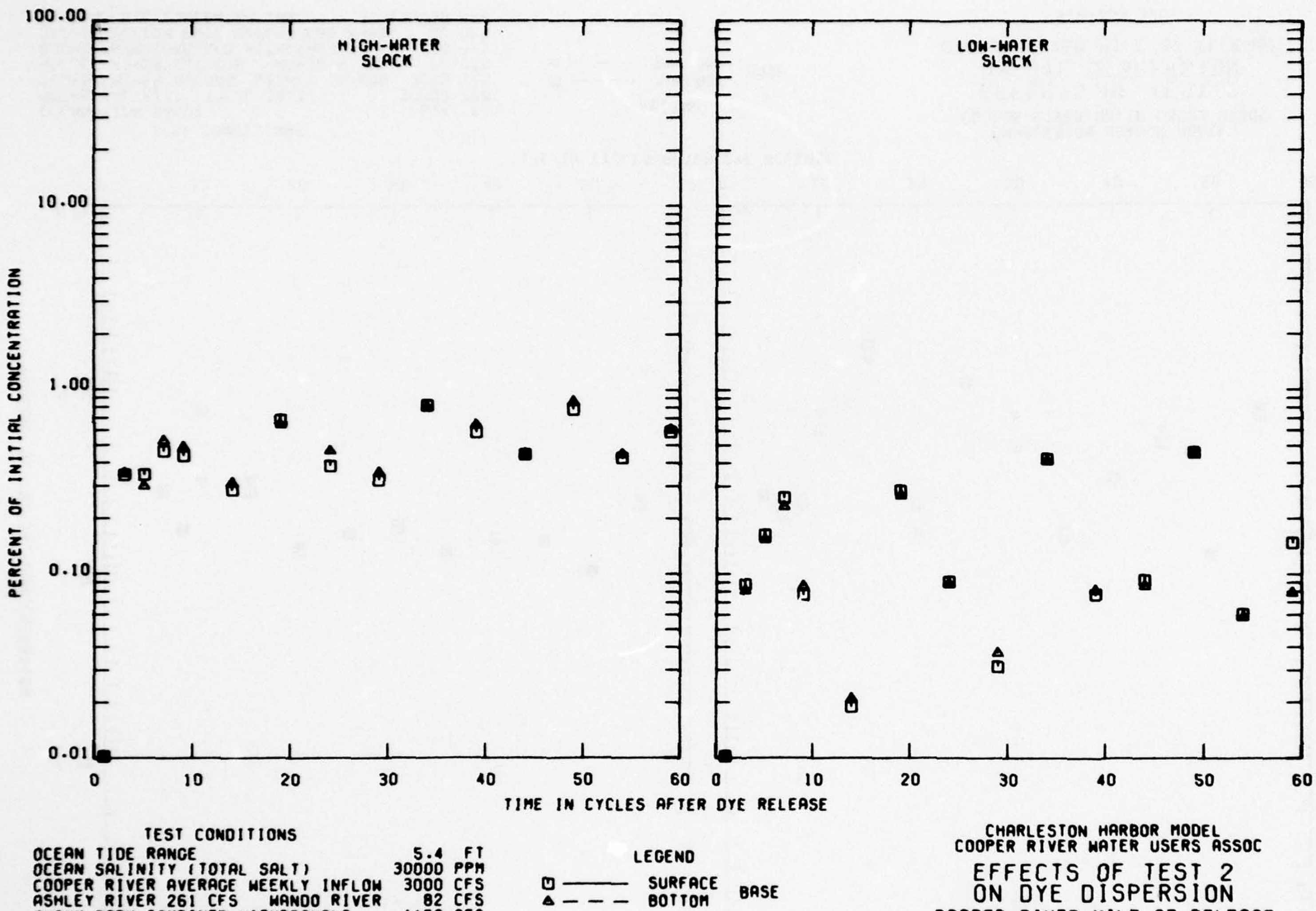
□ ——— SURFACE
△ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 2
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION 38C



TEST CONDITIONS

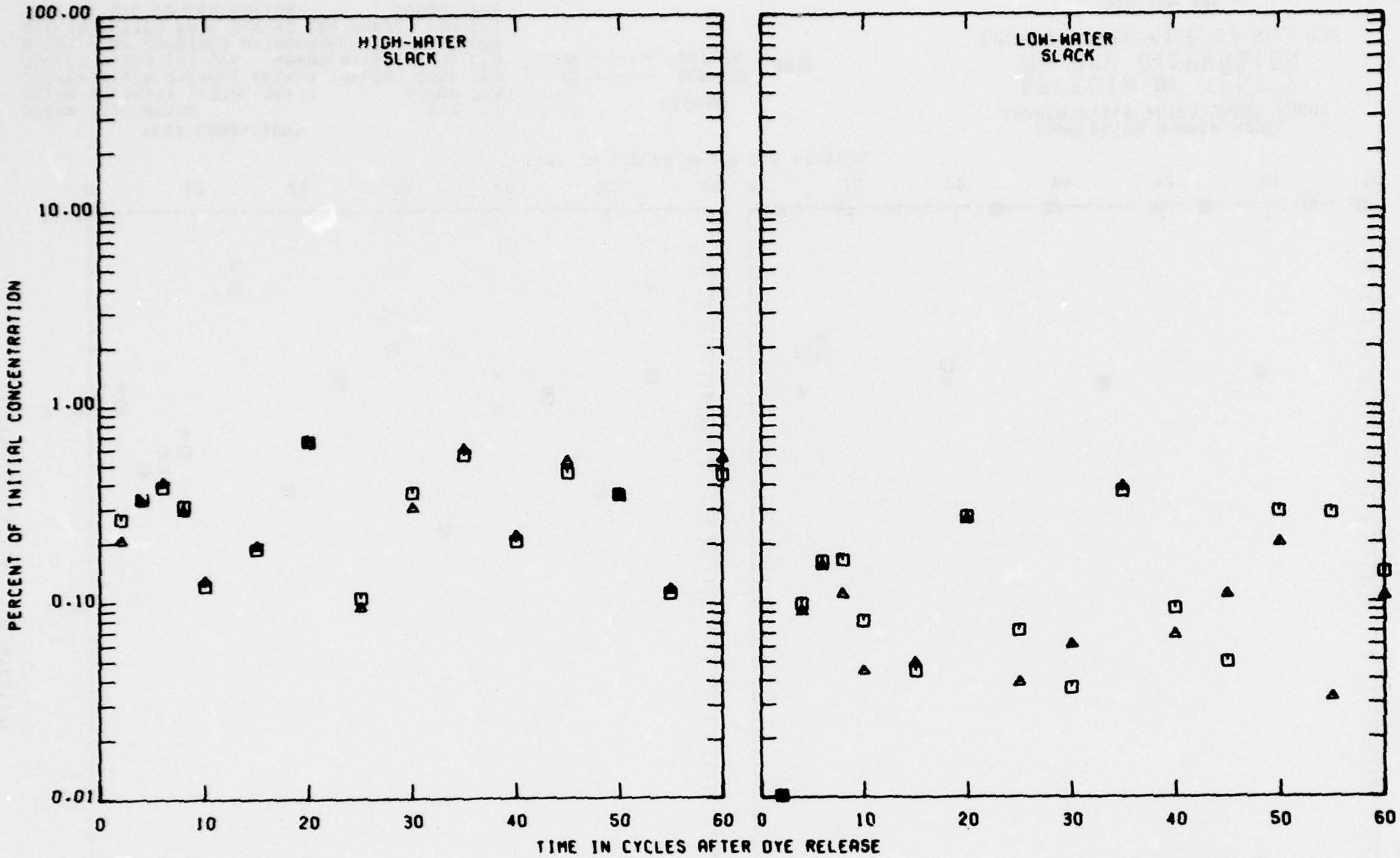
OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
DYE INJECTION RATE DURING EBB PHASE	30	CFS
INITIAL DYE CONCENTRATION	100000	PPB

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 2
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION TEE



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
DYE INJECTION RATE DURING EBB PHASE	30	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

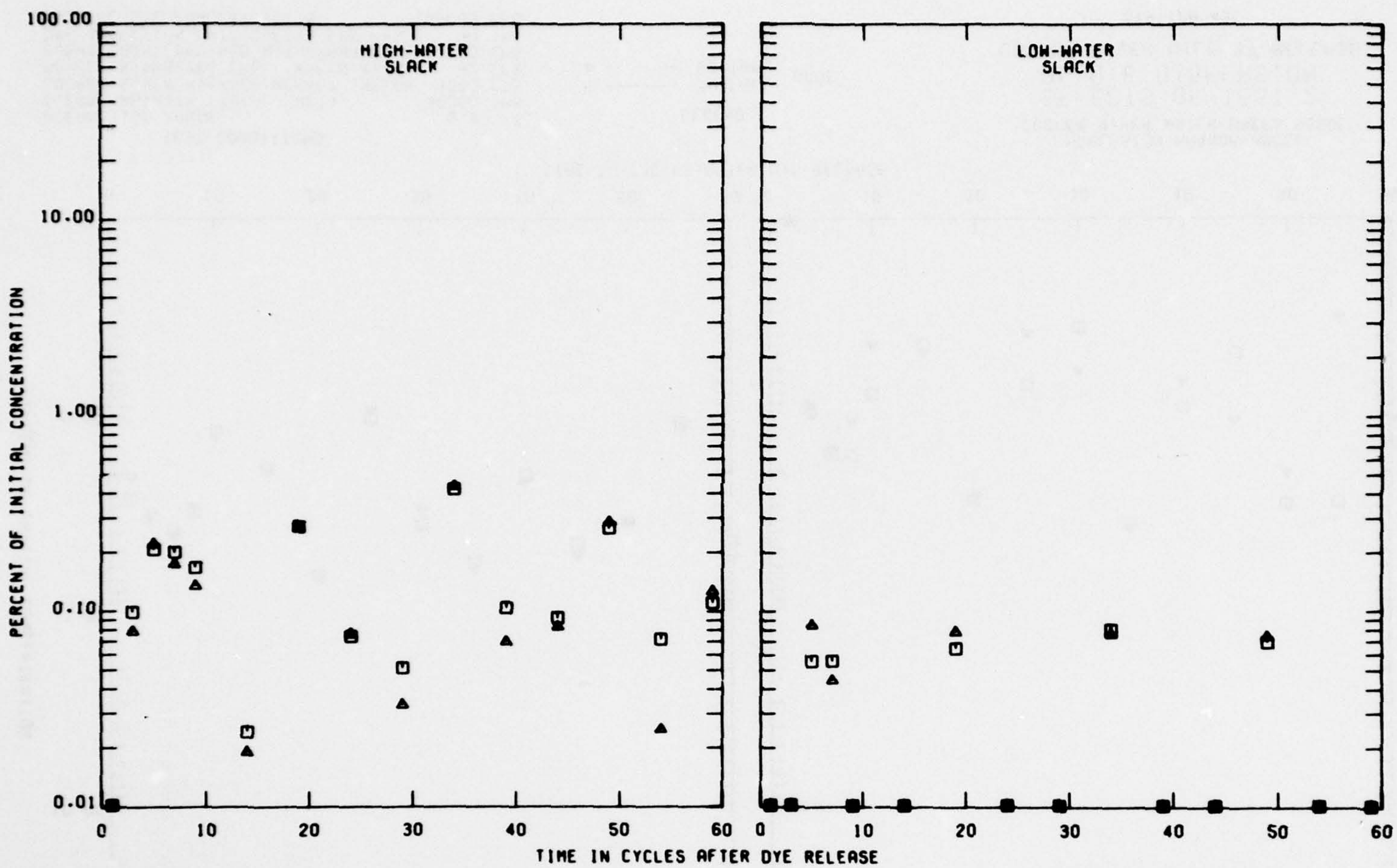
□ ——— SURFACE BASE
▲ – – – BOTTOM

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 2
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION 43C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
DYE INJECTION RATE DURING EBB PHASE	30 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

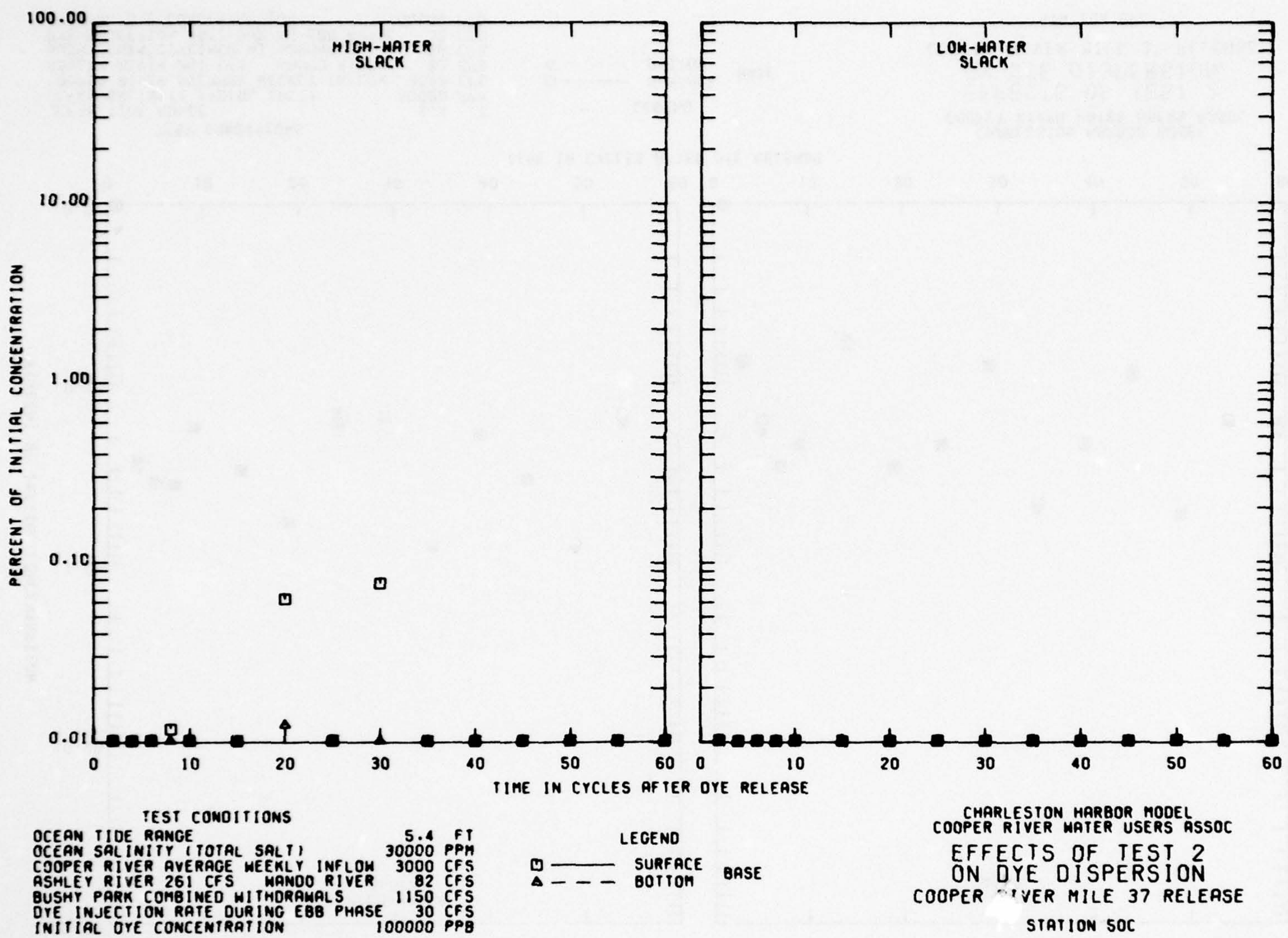
□ ——— SURFACE
▲ — — — BOTTOM
BASE

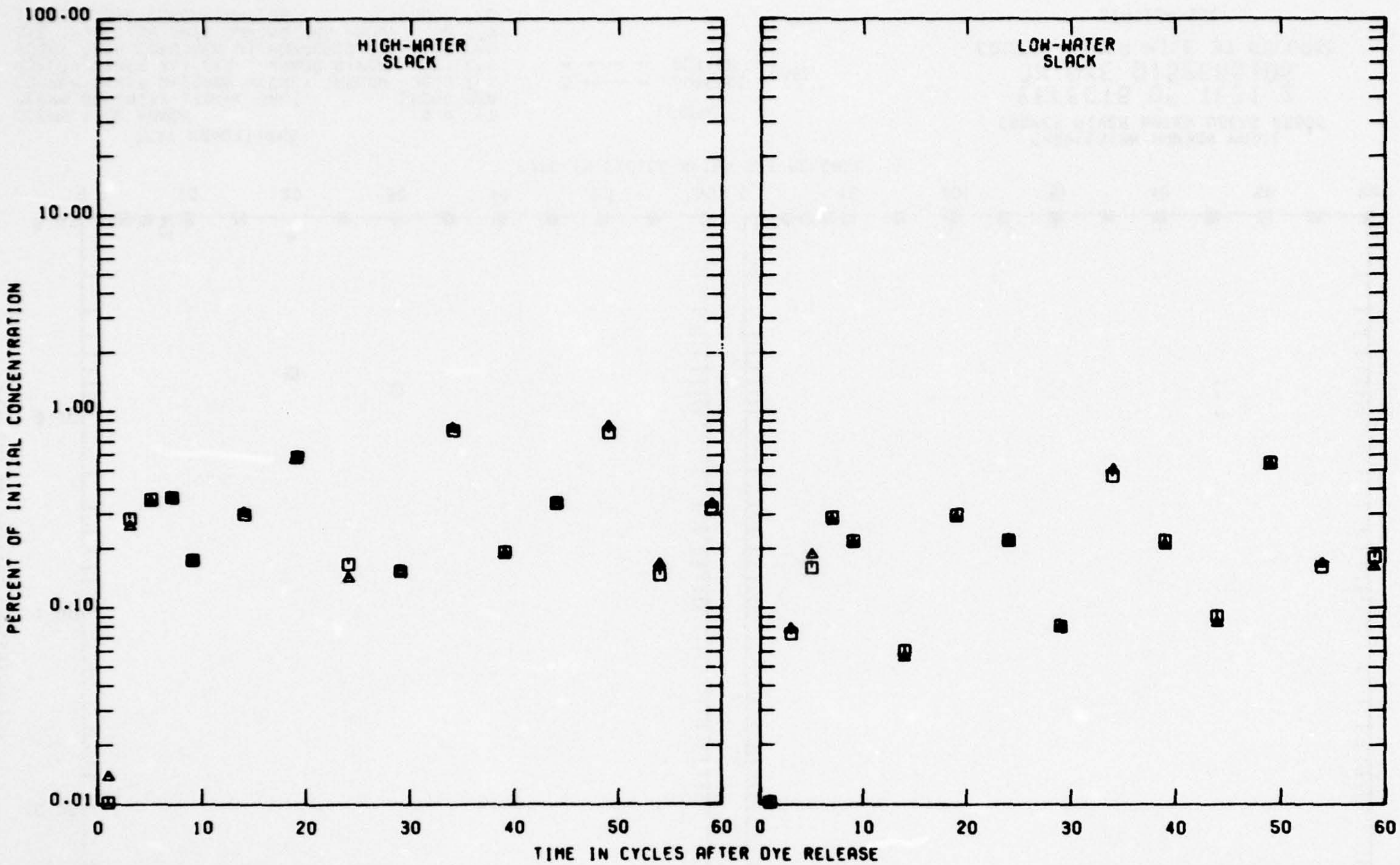
CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 2
ON DYE DISPERSION
COOPER RIVER MILE 37 RELEASE

STATION 45C

PLATE 32


100.00
10.00
1.00
0.10
0.01
PERCENT OF INITIAL CONCENTRATION
HIGH-WATER SLACK
LOW-WATER SLACK
0
10
20
30
40
50
60
TIME IN CYCLES AFTER DYE RELEASE
TEST CONDITIONS
OCEAN TIDE RANGE 5.4 FT
OCEAN SALINITY (TOTAL SALT) 30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW 3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER 82 CFS
BUSHY PARK COMBINED WITHDRAWALS 1150 CFS
DYE INJECTION RATE DURING EBB PHASE 30 CFS
INITIAL DYE CONCENTRATION 100000 PPB
LEGEND
SURFACE
BOTTOM
BASE
CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC
EFFECTS OF TEST 2
ON DYE DISPERSION
COOPER RIVER MILE 37 RELEASE
STATION 50C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
DYE INJECTION RATE DURING EBB PHASE	30	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

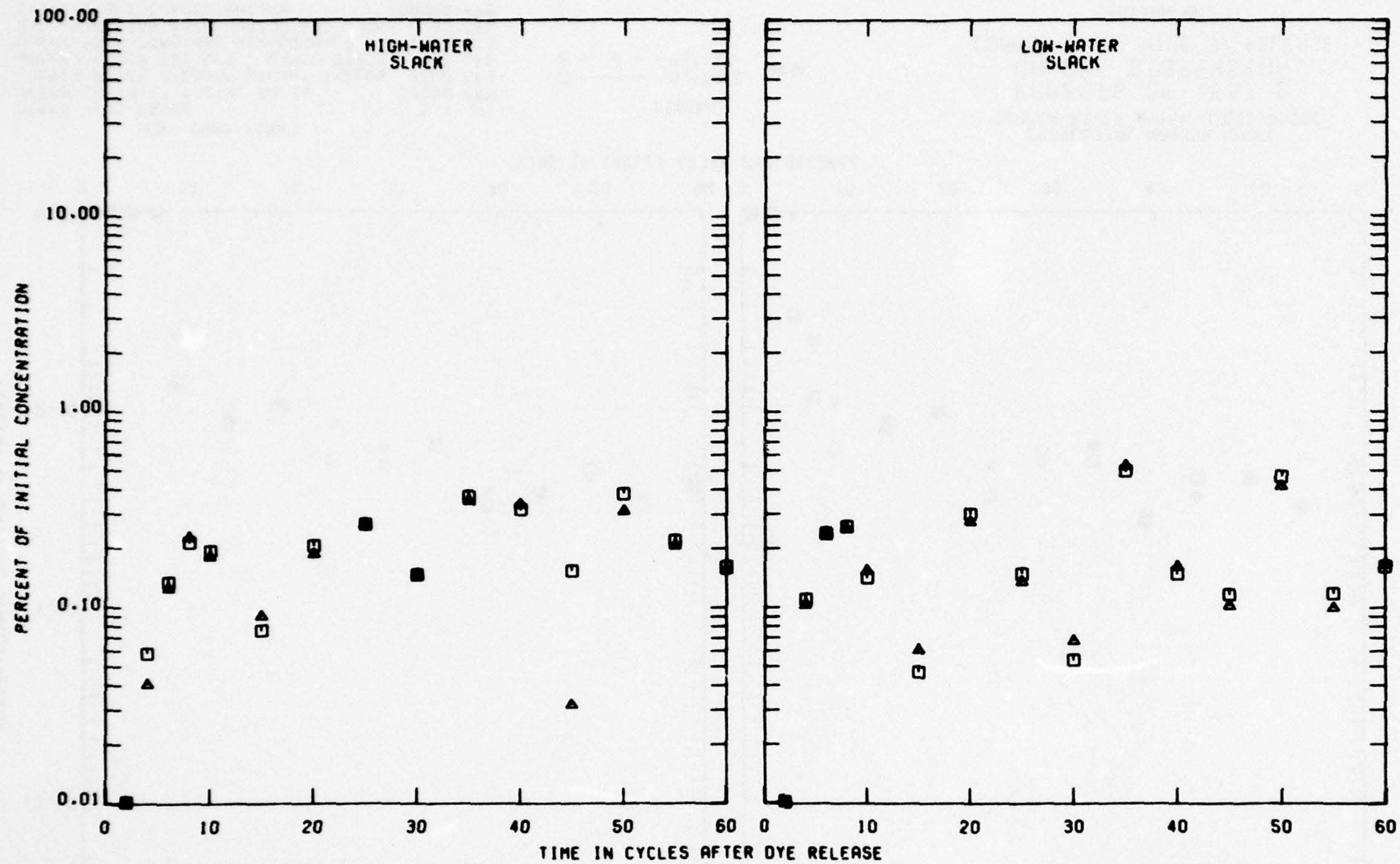
□ ——— SURFACE
▲ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 2
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION BRC



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
DYE INJECTION RATE DURING EBB PHASE	30	CFS
INITIAL DYE CONCENTRATION	100000	PPB

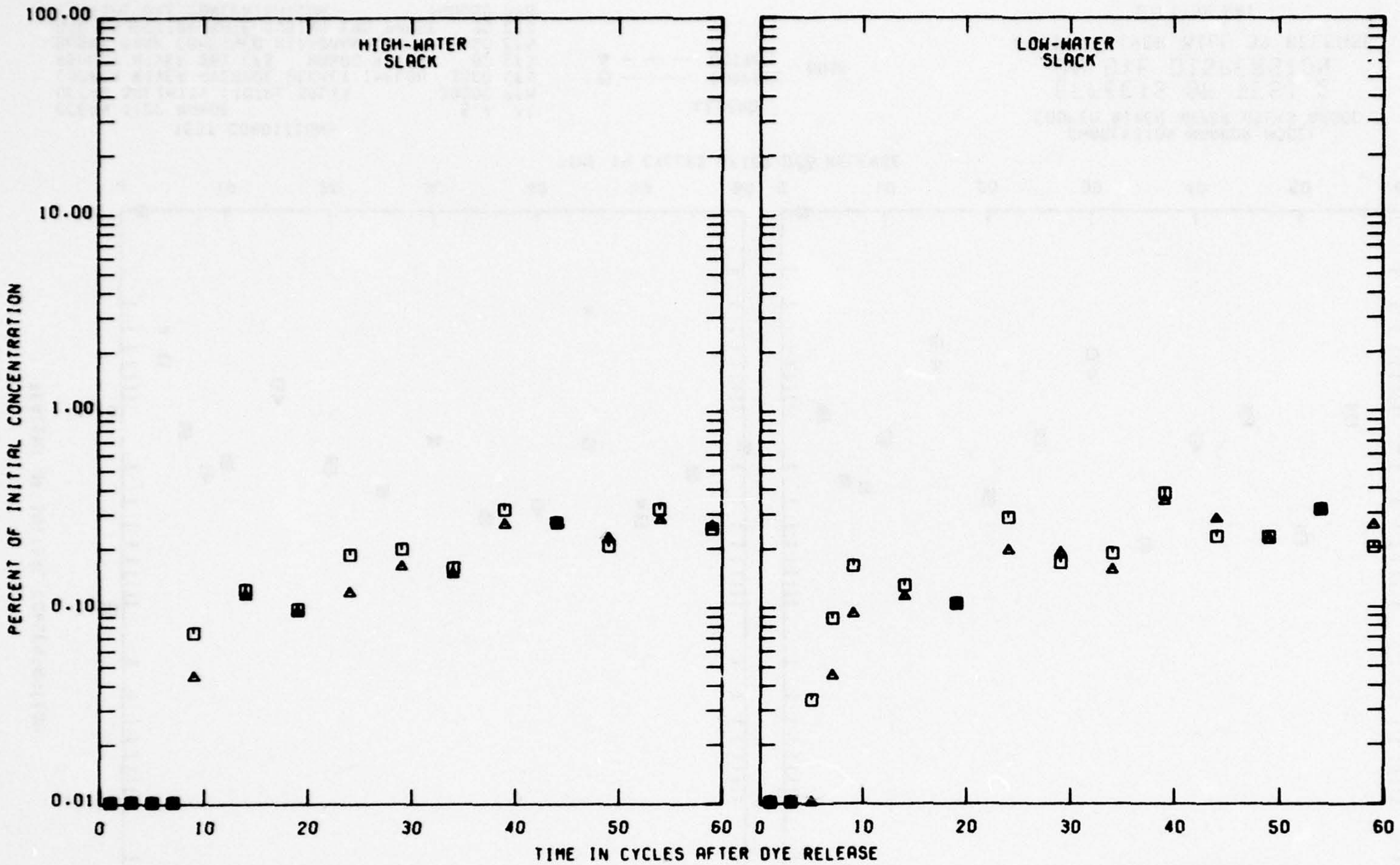
LEGEND

□ ——— SURFACE
△ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 2
ON DYE DISPERSION
COOPER RIVER MILE 37 RELEASE

STATION BR1



TEST CONDITIONS	
OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
DYE INJECTION RATE DURING EBB PHASE	30 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

□ ——— SURFACE
△ – – – BOTTOM
BASE

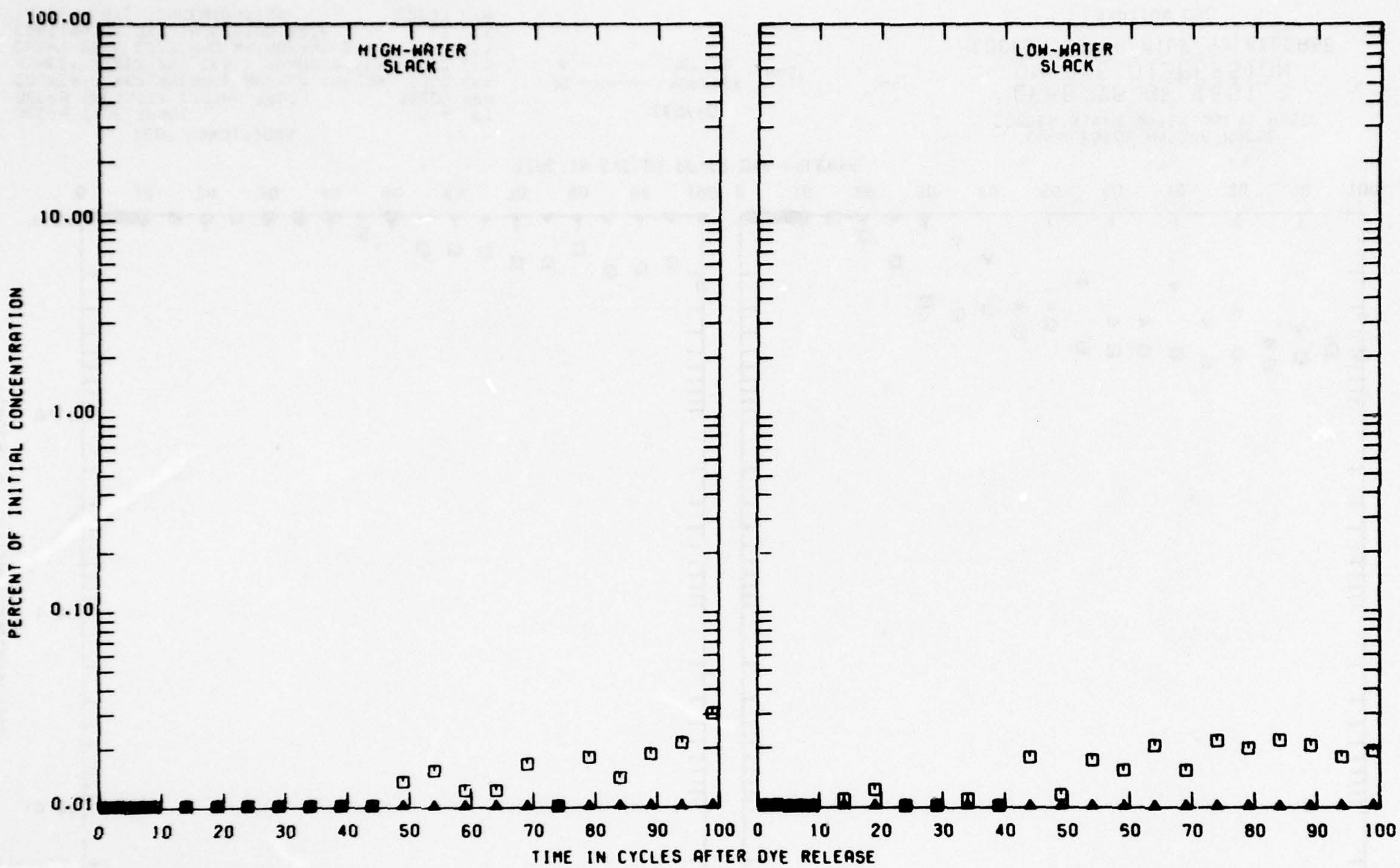
CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 2
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION BR2

PLATE 36



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
CONTINUOUS DYE INJECTION RATE	15	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

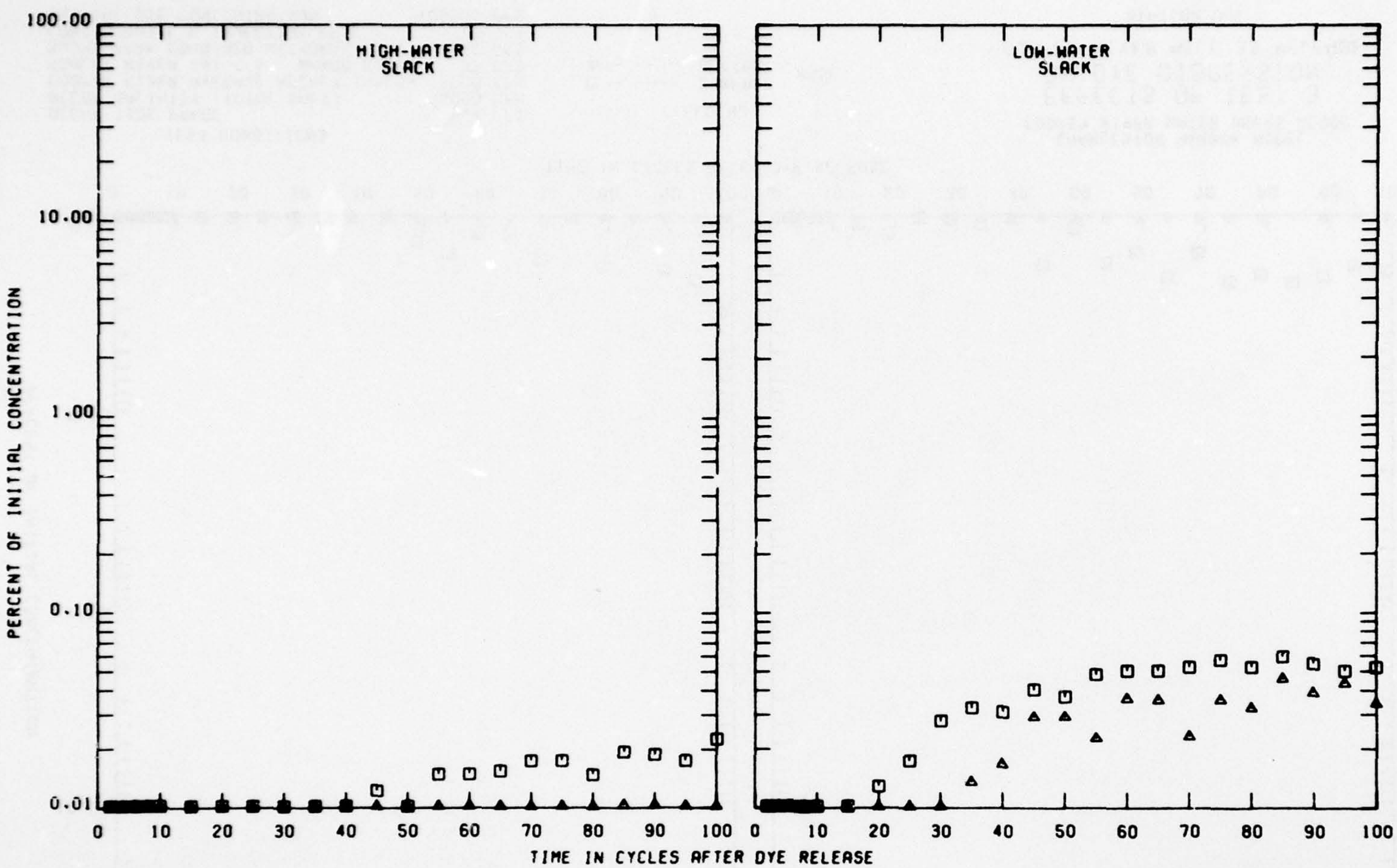
□ — —— SURFACE
▲ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 3
ON DYE DISPERSION

COOPER RIVER MILE 33 RELEASE

STATION OOC



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
CONTINUOUS DYE INJECTION RATE	15	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

□ ——— SURFACE BASE
△ — — — BOTTOM

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 3
ON DYE DISPERSION

COOPER RIVER MILE 33 RELEASE

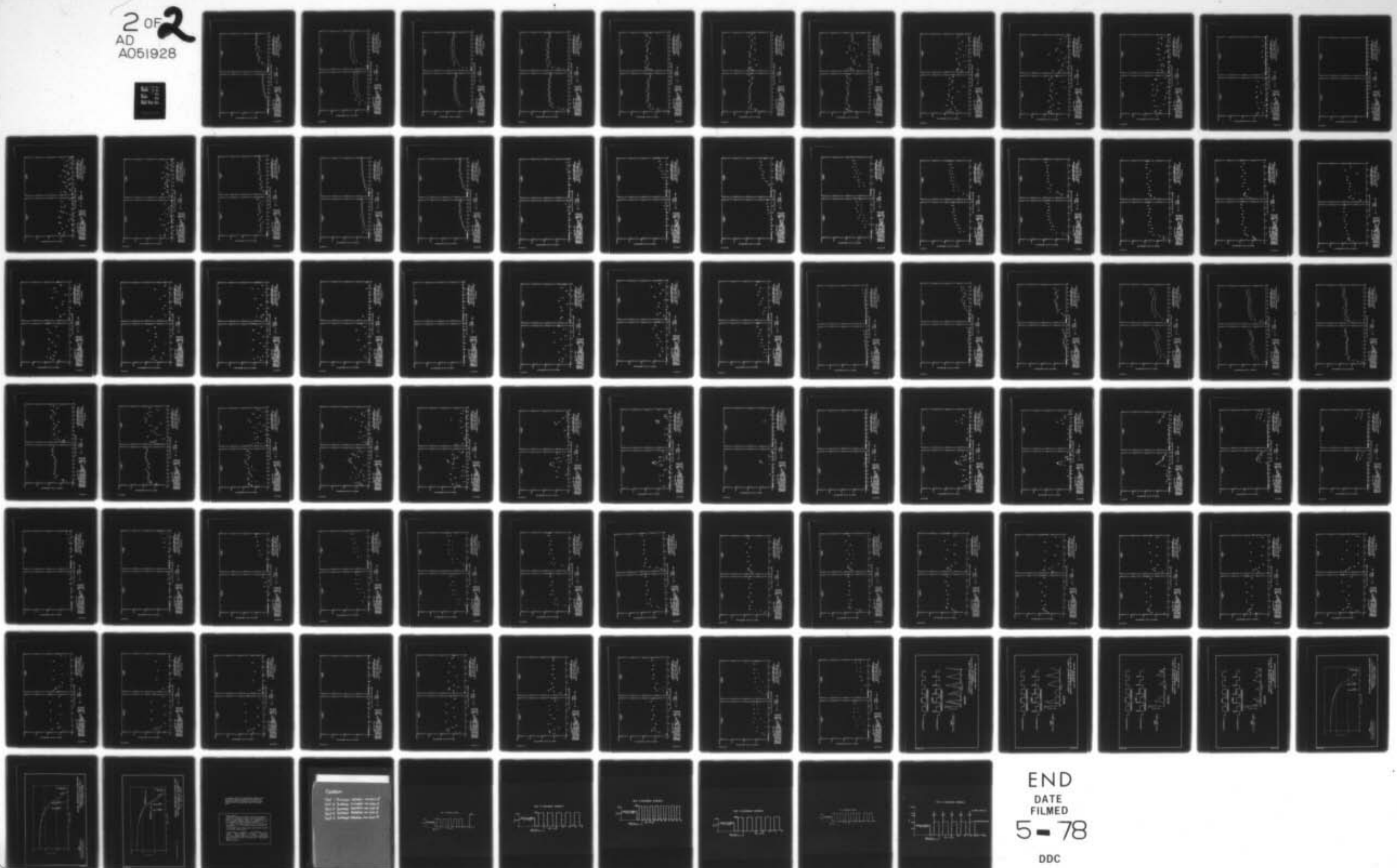
STATION OSC

PLATE 38

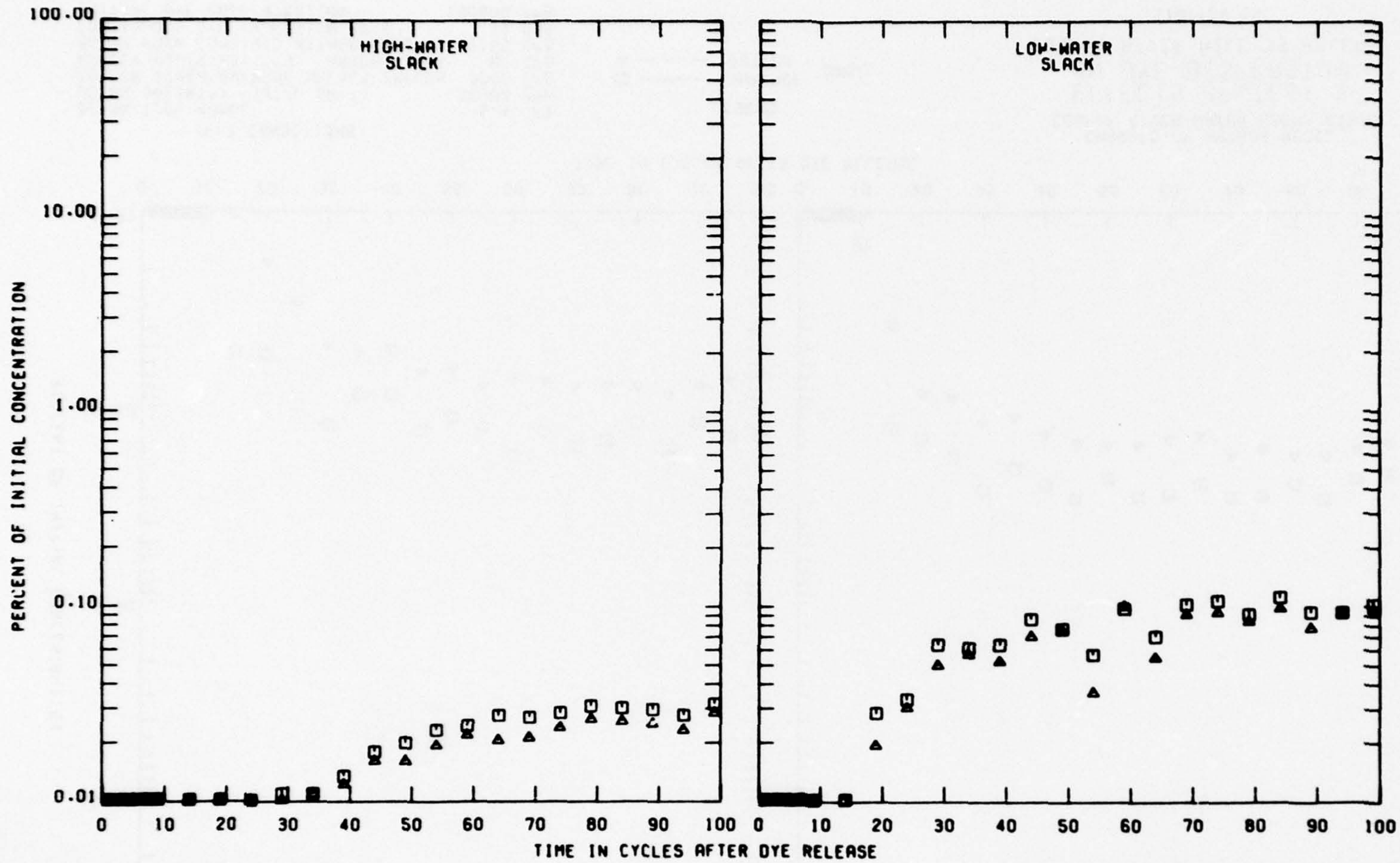
AD-A051 928 ARMY ENGINEER WATERWAYS EXPERIMENT STATION VICKSBURG MISS F/G 13/2
DISPERSION OF PROPOSED EFFLUENT DISCHARGES AND SALTWATER INTRUS--ETC(U)
NOV 77 H A BENSON, R A BOLAND

UNCLASSIFIED WES-MP-H-77-14 NL

2 OF 2
AD
A051928



END
DATE
FILMED
5-78
DDC



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
CONTINUOUS DYE INJECTION RATE	15	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

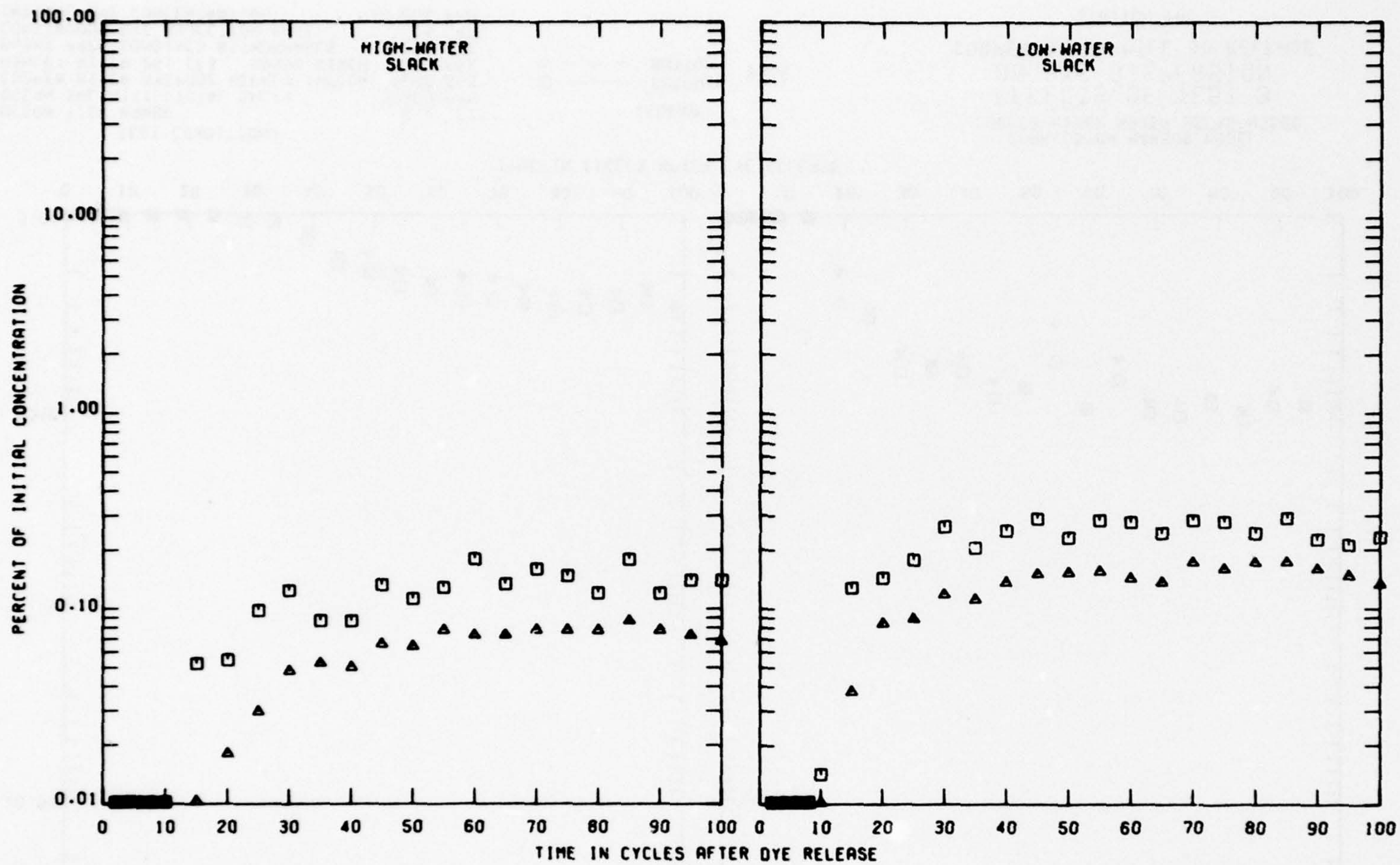
□ ——— SURFACE
△ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 3
ON DYE DISPERSION

COOPER RIVER MILE 33 RELEASE

STATION 10C



TEST CONDITIONS	
OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

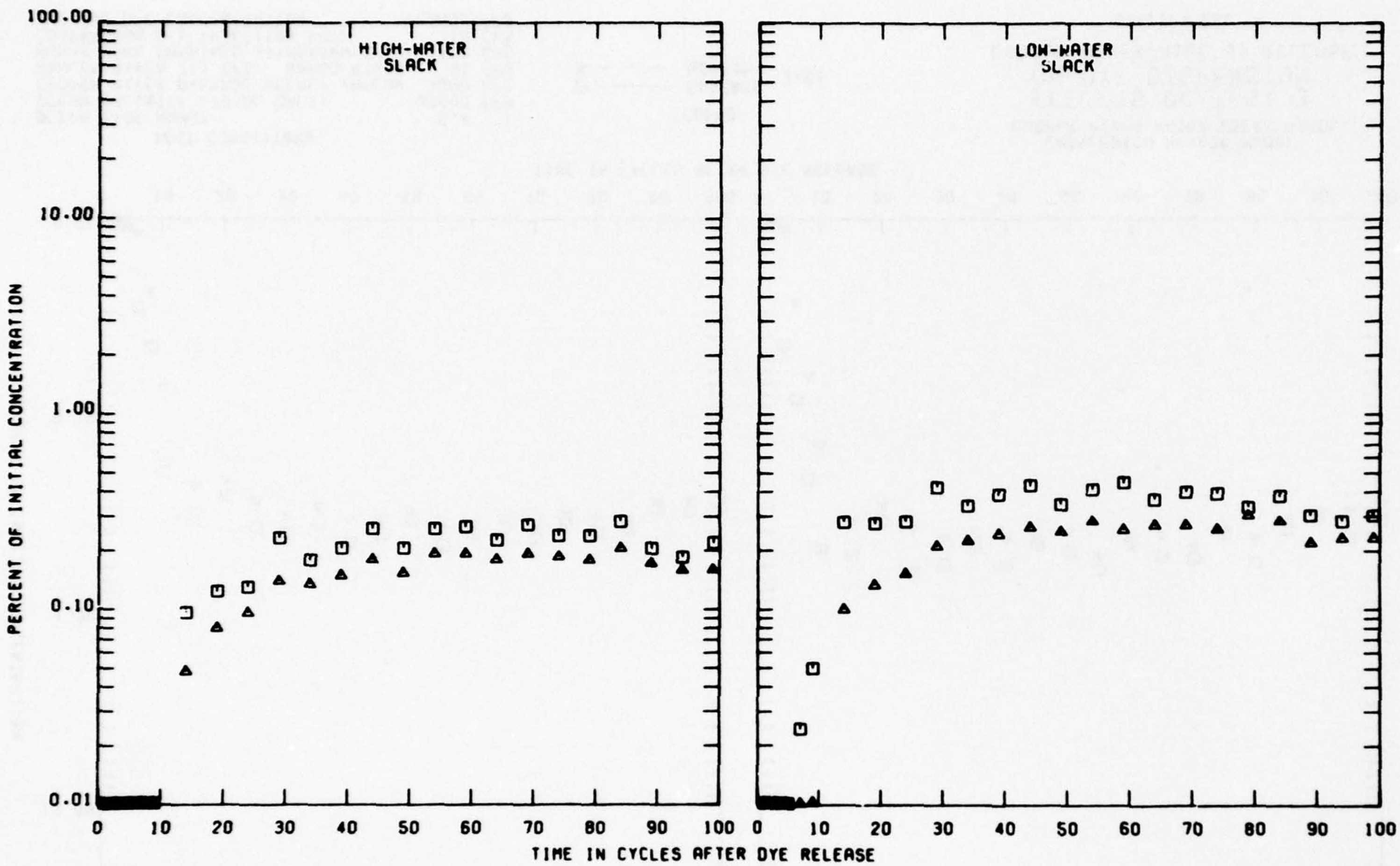
□ ——— SURFACE
△ – – – BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 3
ON DYE DISPERSION

COOPER RIVER MILE 33 RELEASE

STATION 15C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

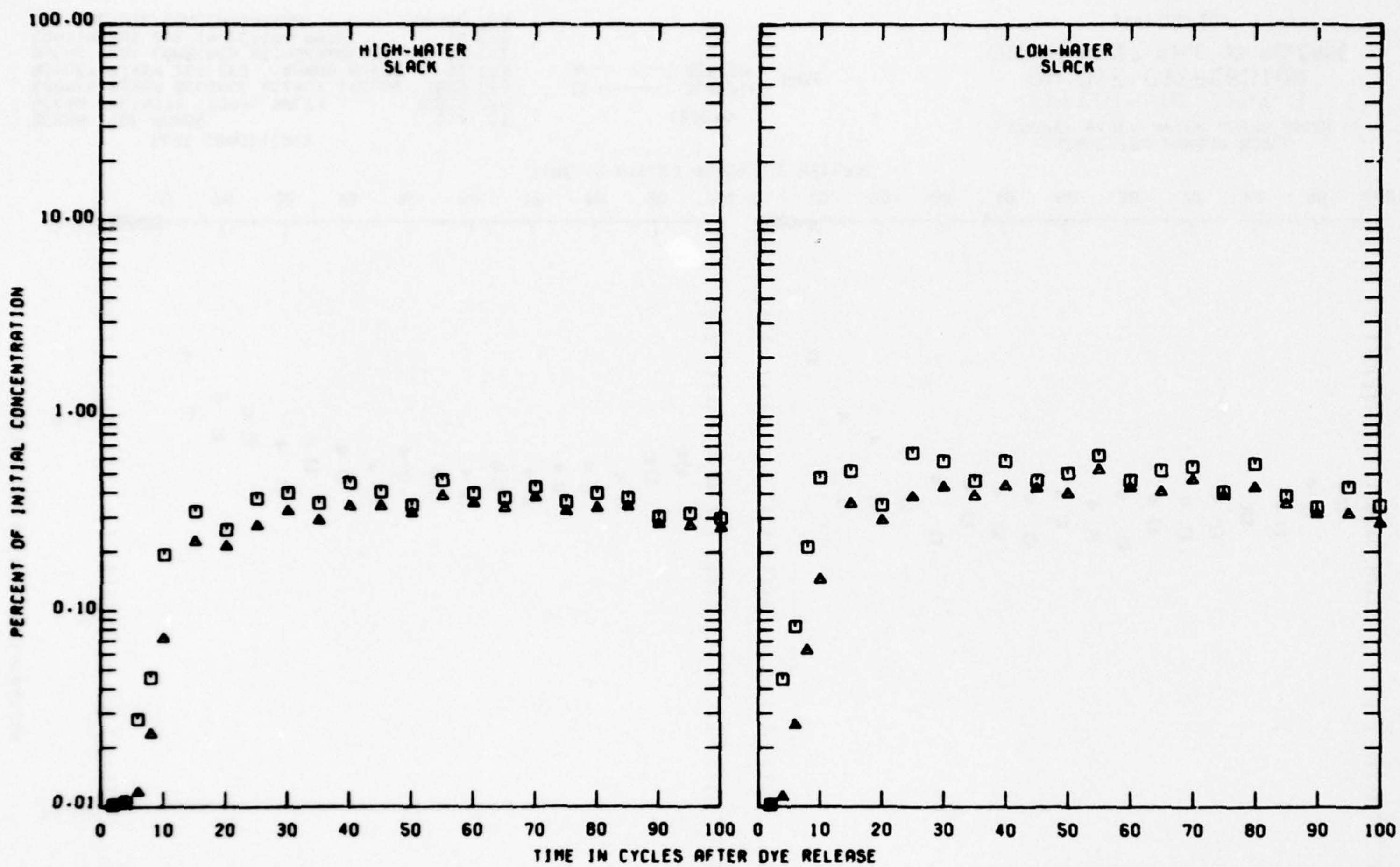
□ ——— SURFACE BASE
▲ – – – BOTTOM

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 3
ON DYE DISPERSION

COOPER RIVER MILE 33 RELEASE

STATION 20C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
CONTINUOUS DYE INJECTION RATE	15	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

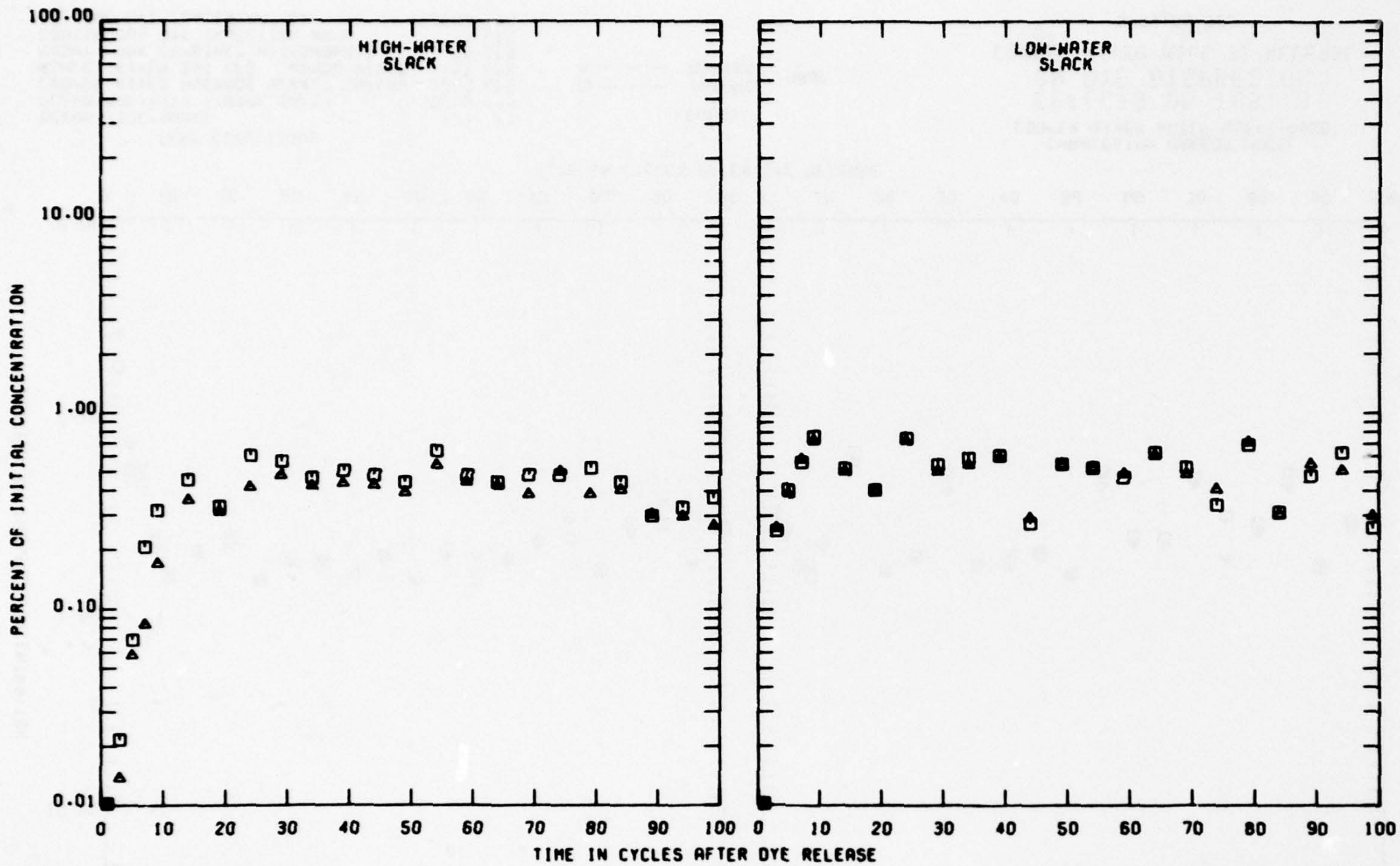
□ ——— SURFACE BASE
▲ — — — BOTTOM

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 3
ON DYE DISPERSION
COOPER RIVER MILE 33 RELEASE

STATION 25C

PLATE 42



TEST CONDITIONS	
OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

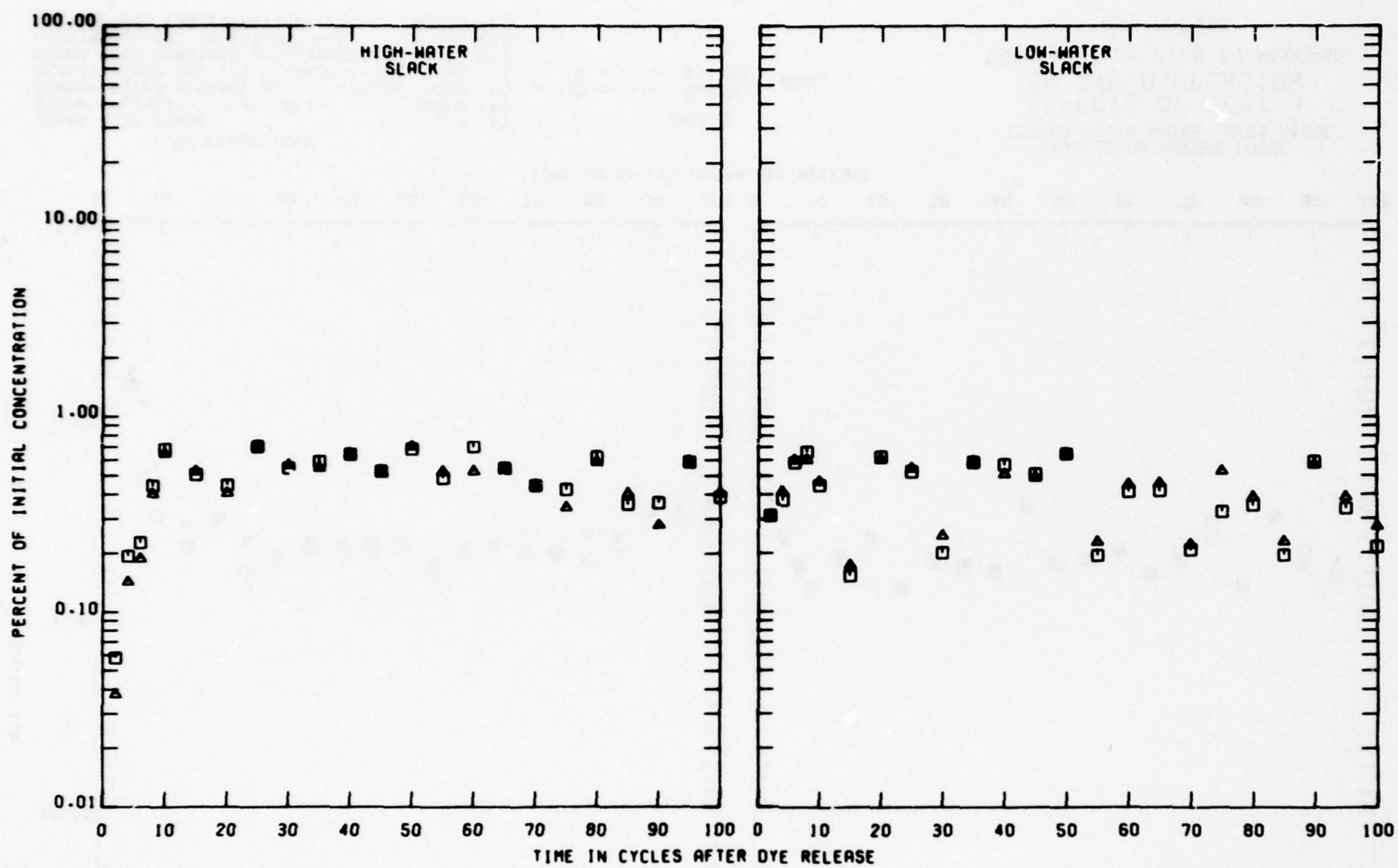
□ ——— SURFACE
▲ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 3
ON DYE DISPERSION

COOPER RIVER MILE 33 RELEASE

STATION 29C



TEST CONDITIONS	
OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

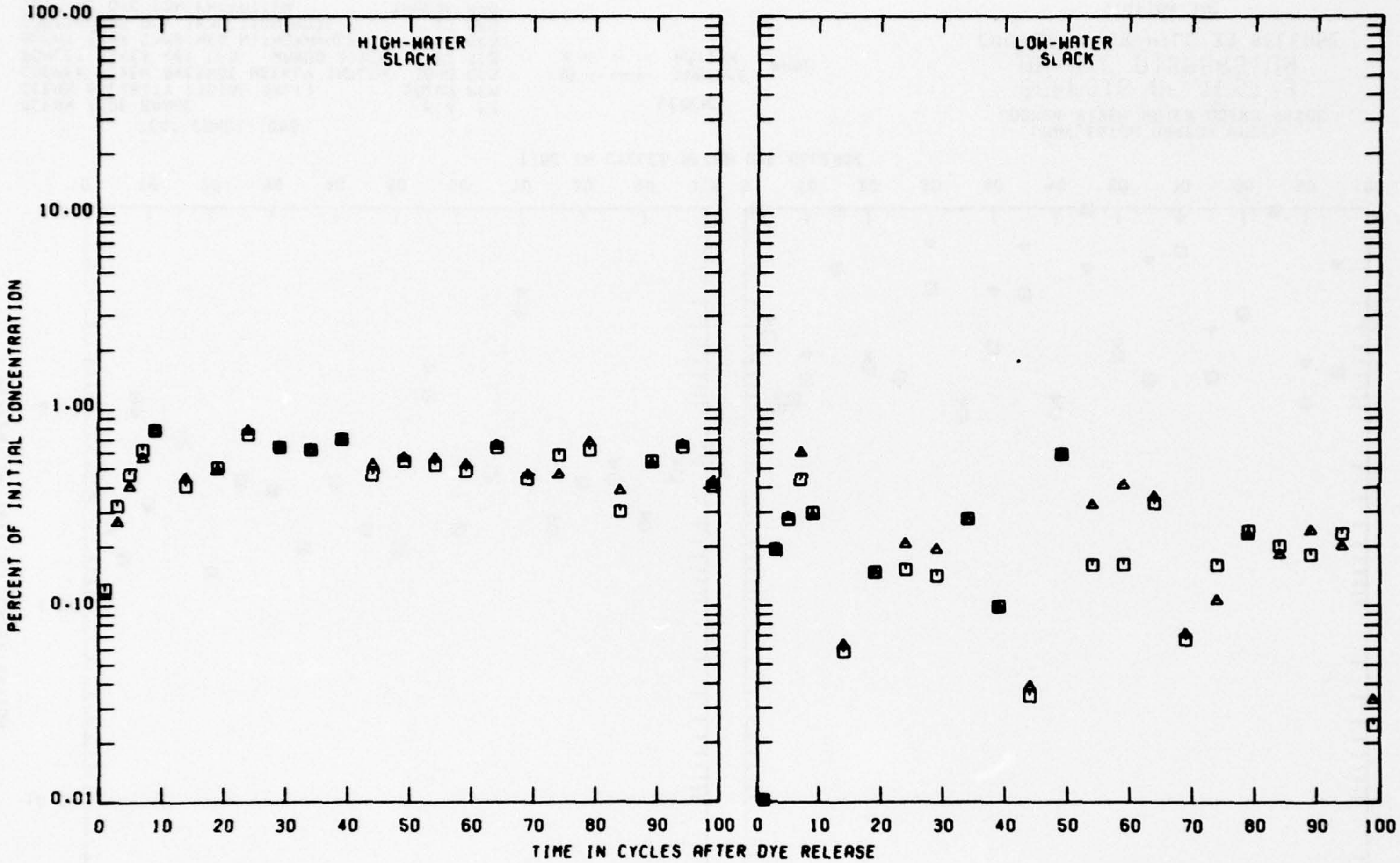
□ ——— SURFACE
▲ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 3
ON DYE DISPERSION
COOPER RIVER MILE 33 RELEASE

STATION 32C

PLATE 44



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

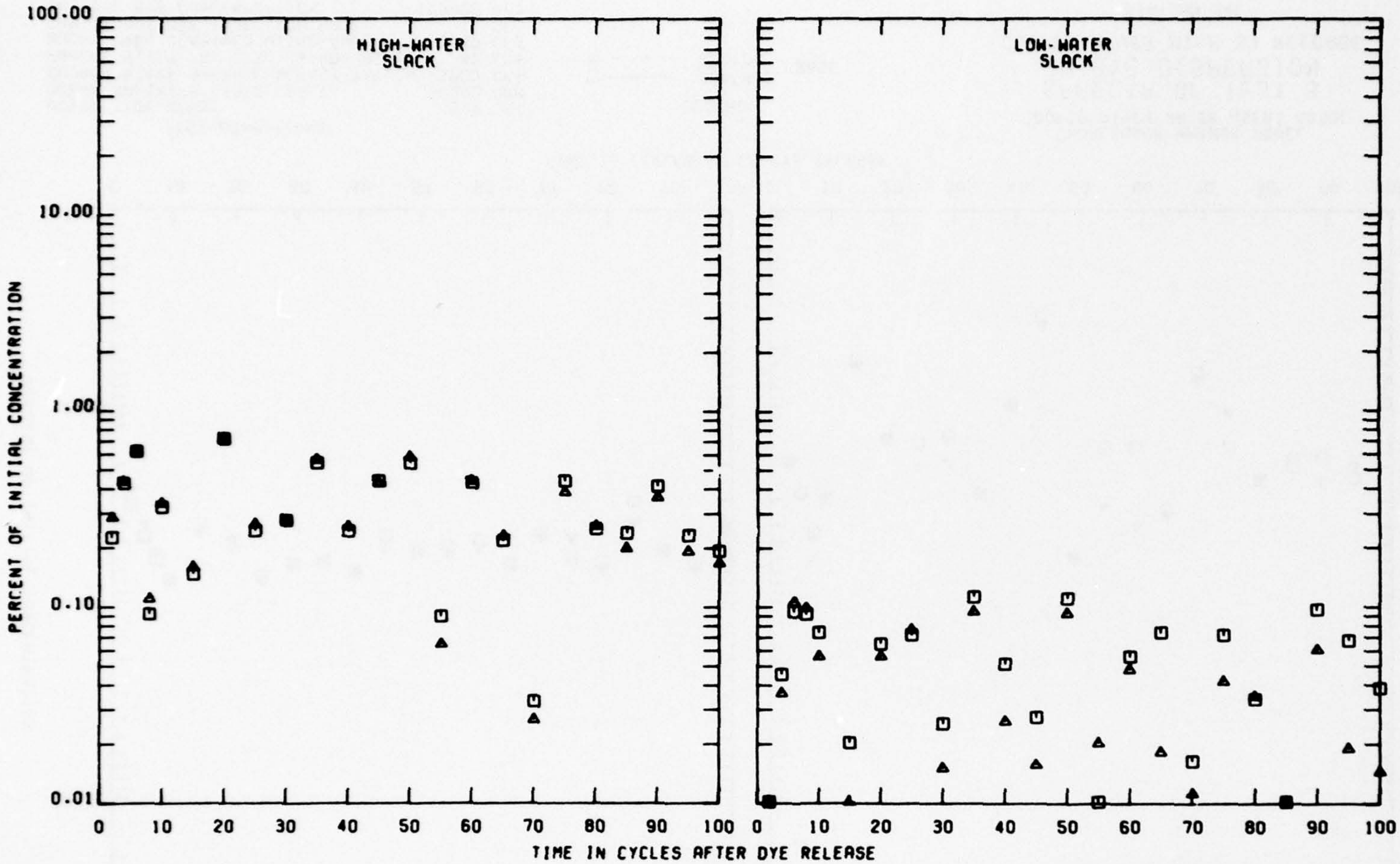
□ ——— SURFACE
△ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 3
ON DYE DISPERSION

COOPER RIVER MILE 33 RELEASE

STATION 34C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

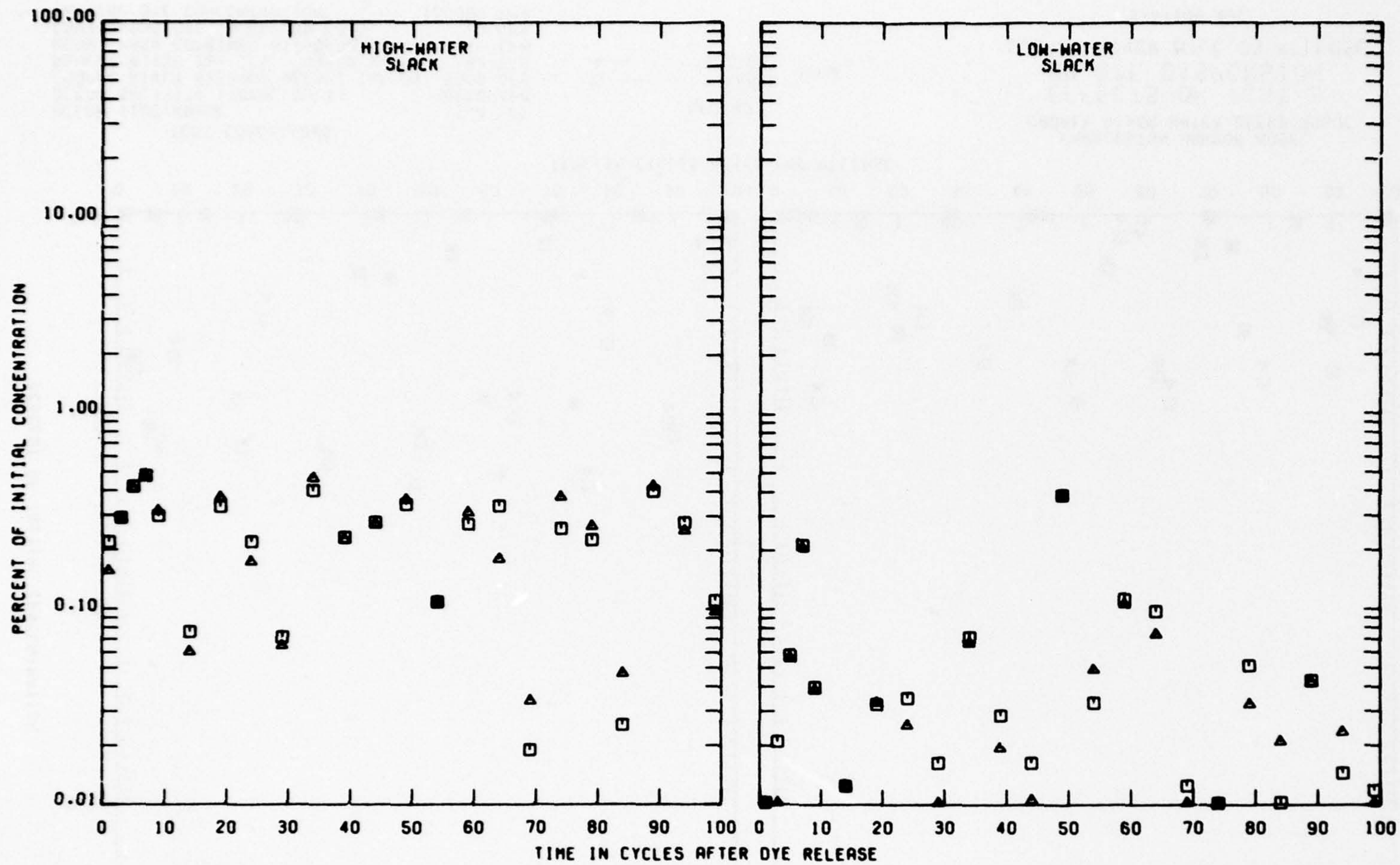
□ ——— SURFACE
△ – – – BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 3
ON DYE DISPERSION

COOPER RIVER MILE 33 RELEASE

STATION 38C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

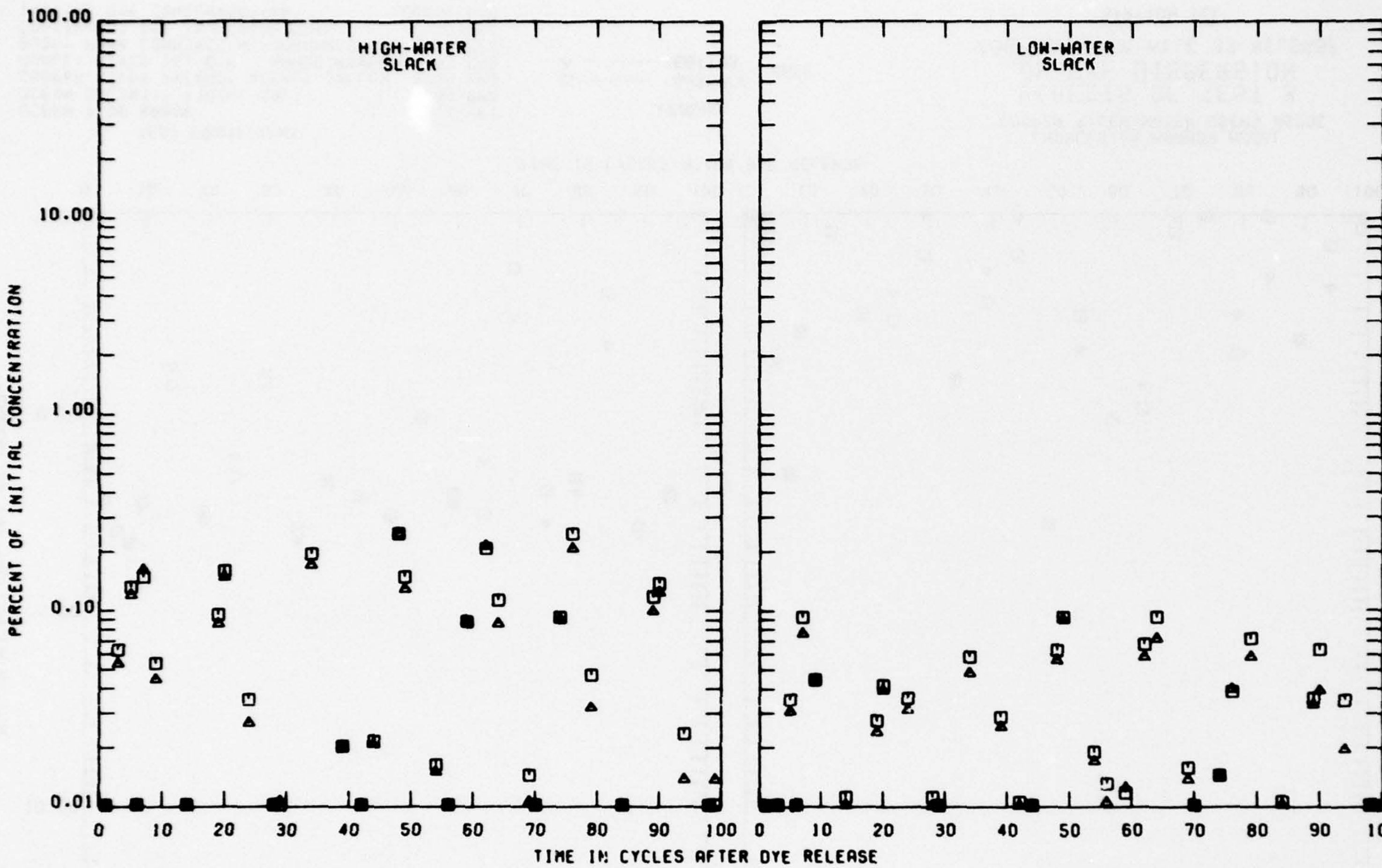
□ ——— SURFACE
△ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 3
ON DYE DISPERSION

COOPER RIVER MILE 33 RELEASE

STATION TEE



TEST CONDITIONS	
OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

□ ——— SURFACE
△ — — — BOTTOM
BASE

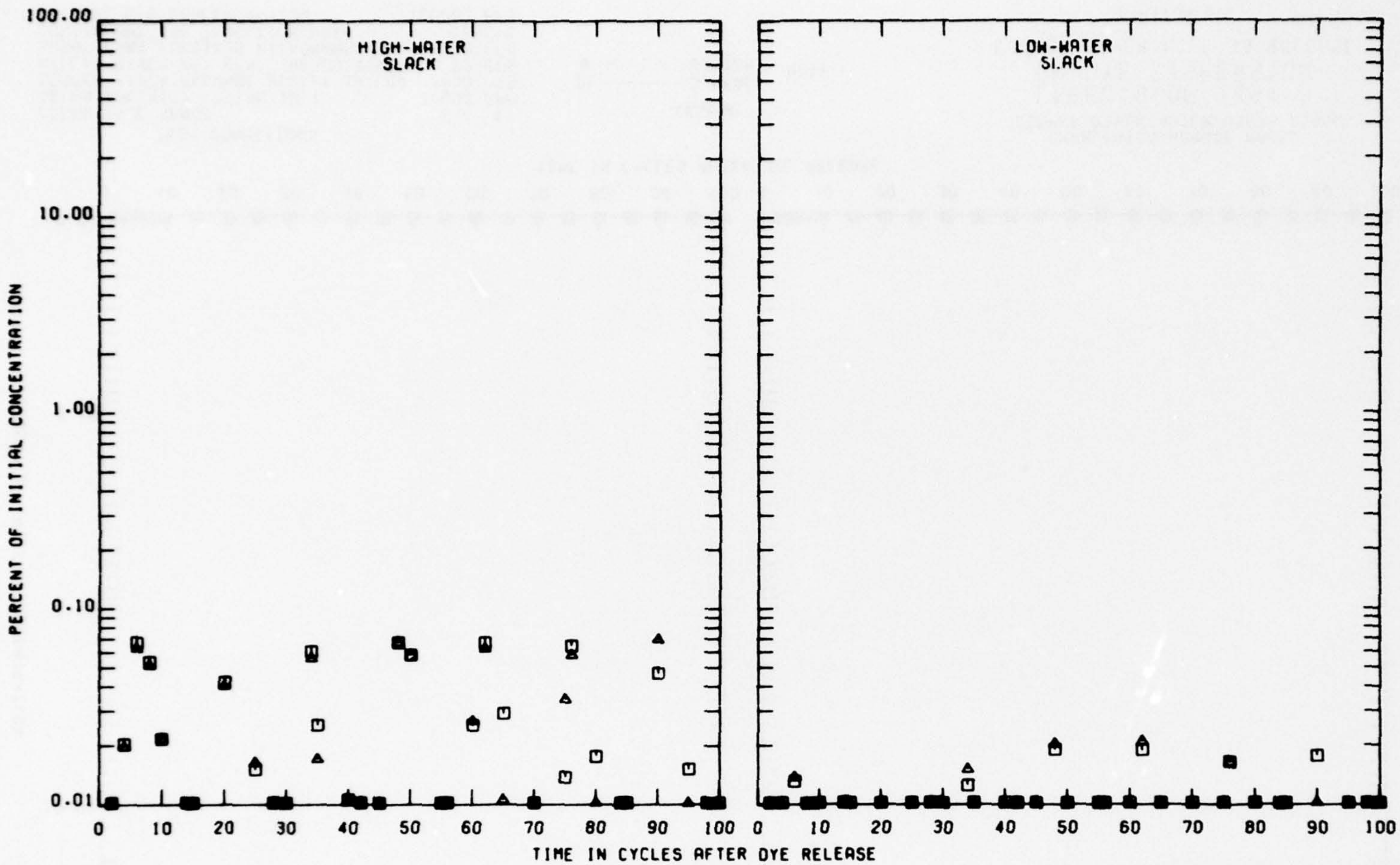
CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 3
ON DYE DISPERSION

COOPER RIVER MILE 33 RELEASE

STATION 43C

PLATE 48



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

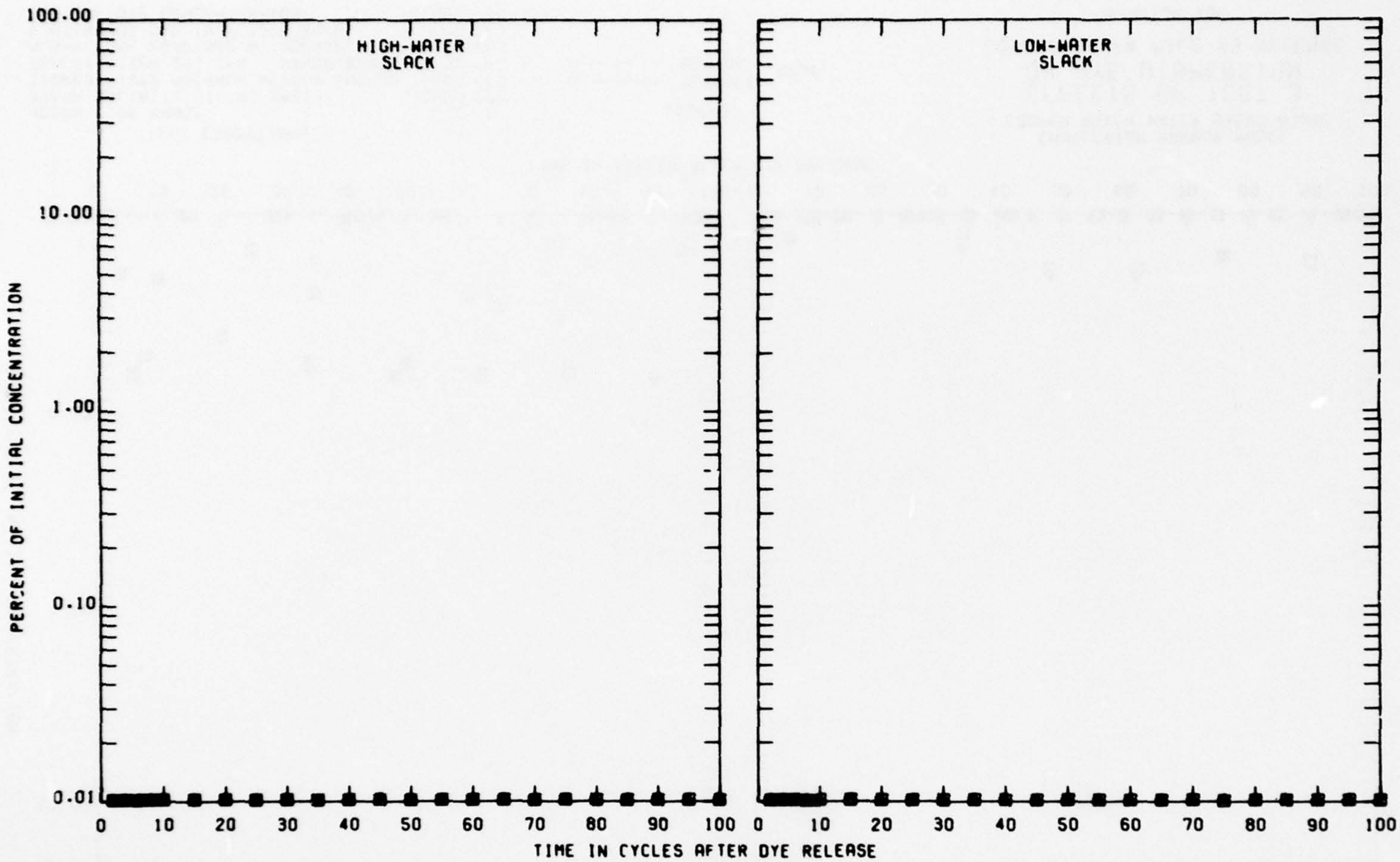
□ ——— SURFACE BASE
△ — — — BOTTOM

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 3
ON DYE DISPERSION

COOPER RIVER MILE 33 RELEASE

STATION 45C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
CONTINUOUS DYE INJECTION RATE	15	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

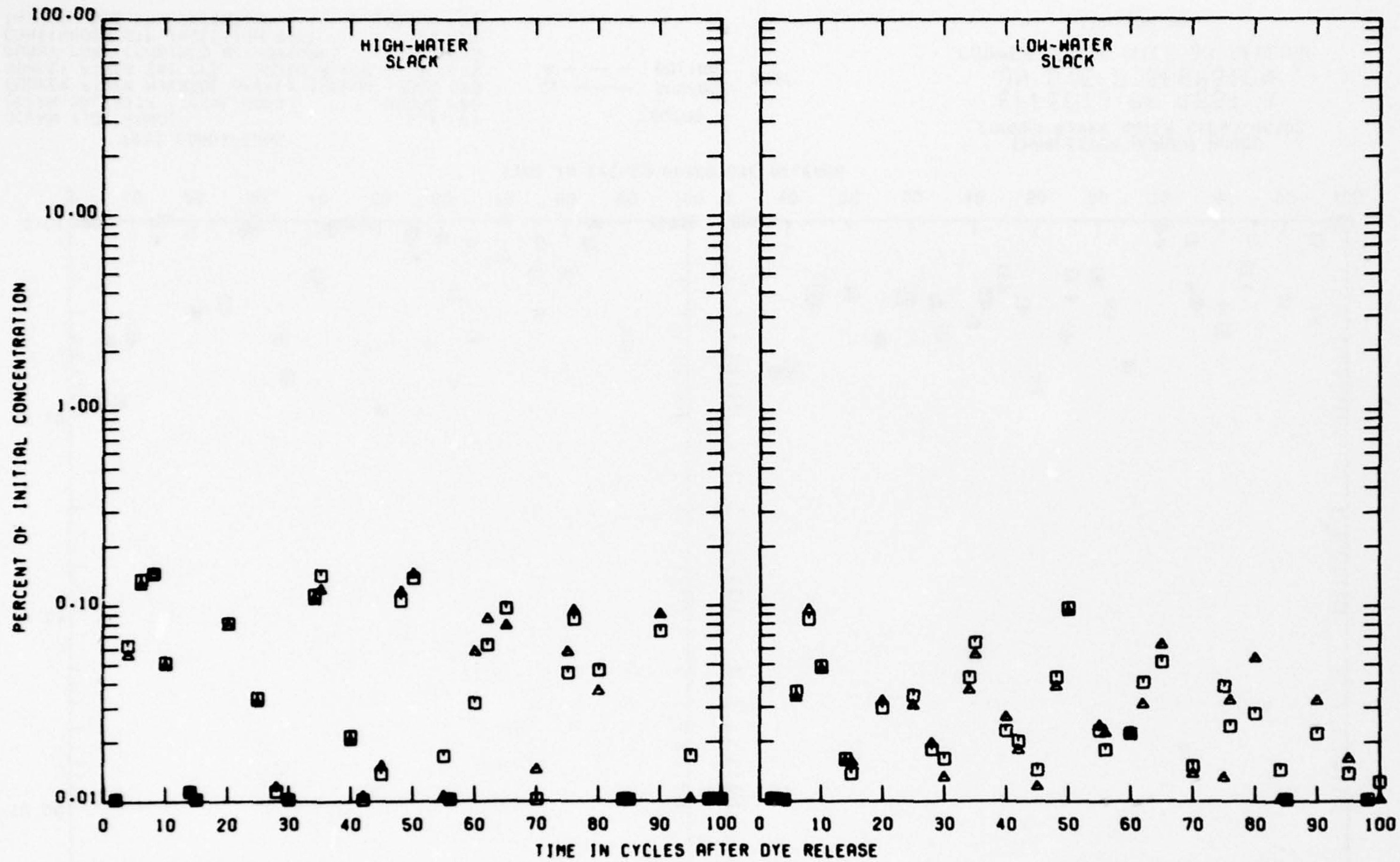
□ ——— SURFACE
△ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 3
ON DYE DISPERSION

COOPER RIVER MILE 33 RELEASE

STATION 50C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
CONTINUOUS DYE INJECTION RATE	15	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

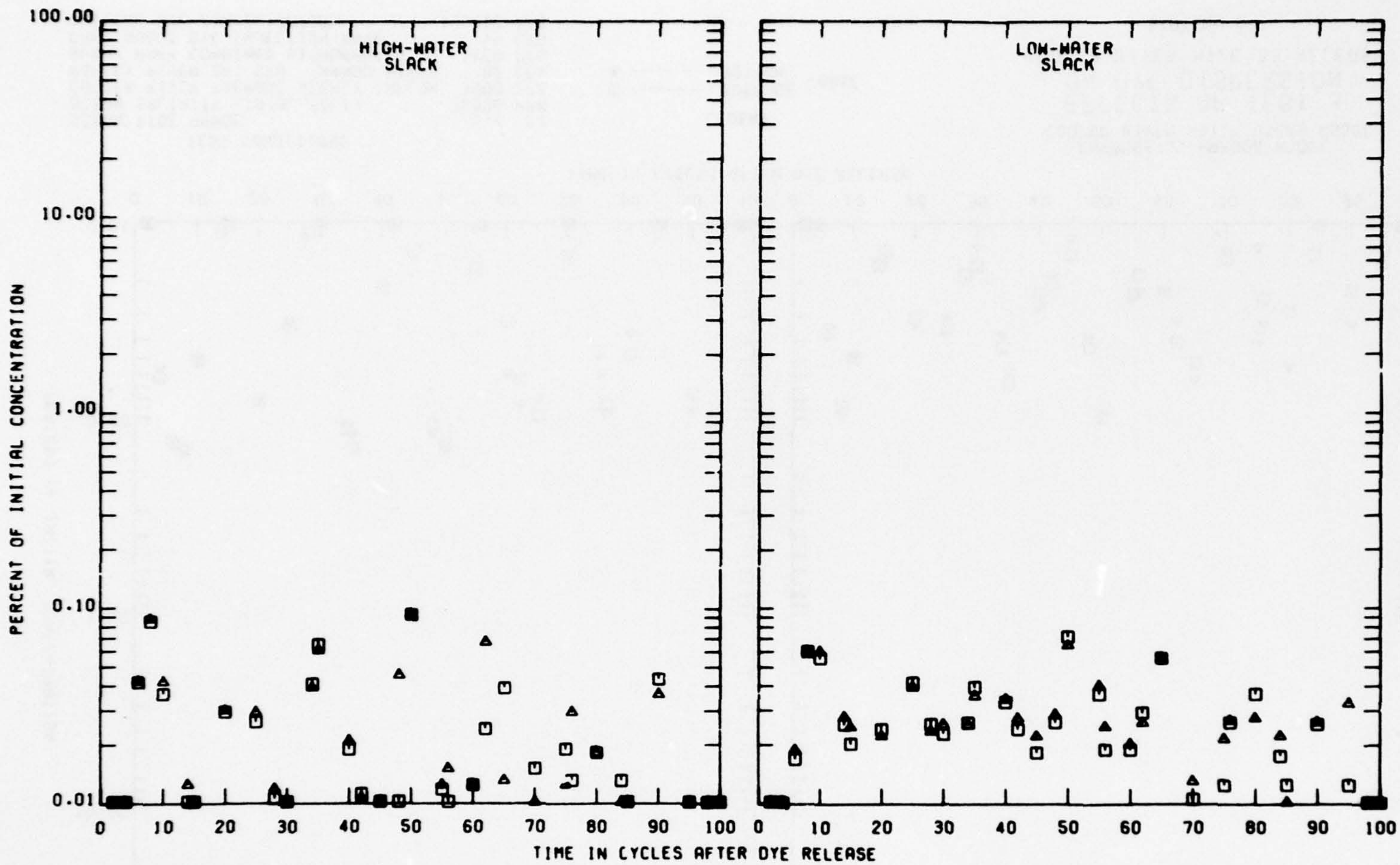
□ ——— SURFACE
△ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 3
ON DYE DISPERSION

COOPER RIVER MILE 33 RELEASE

STATION BRC



TEST CONDITIONS	
OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

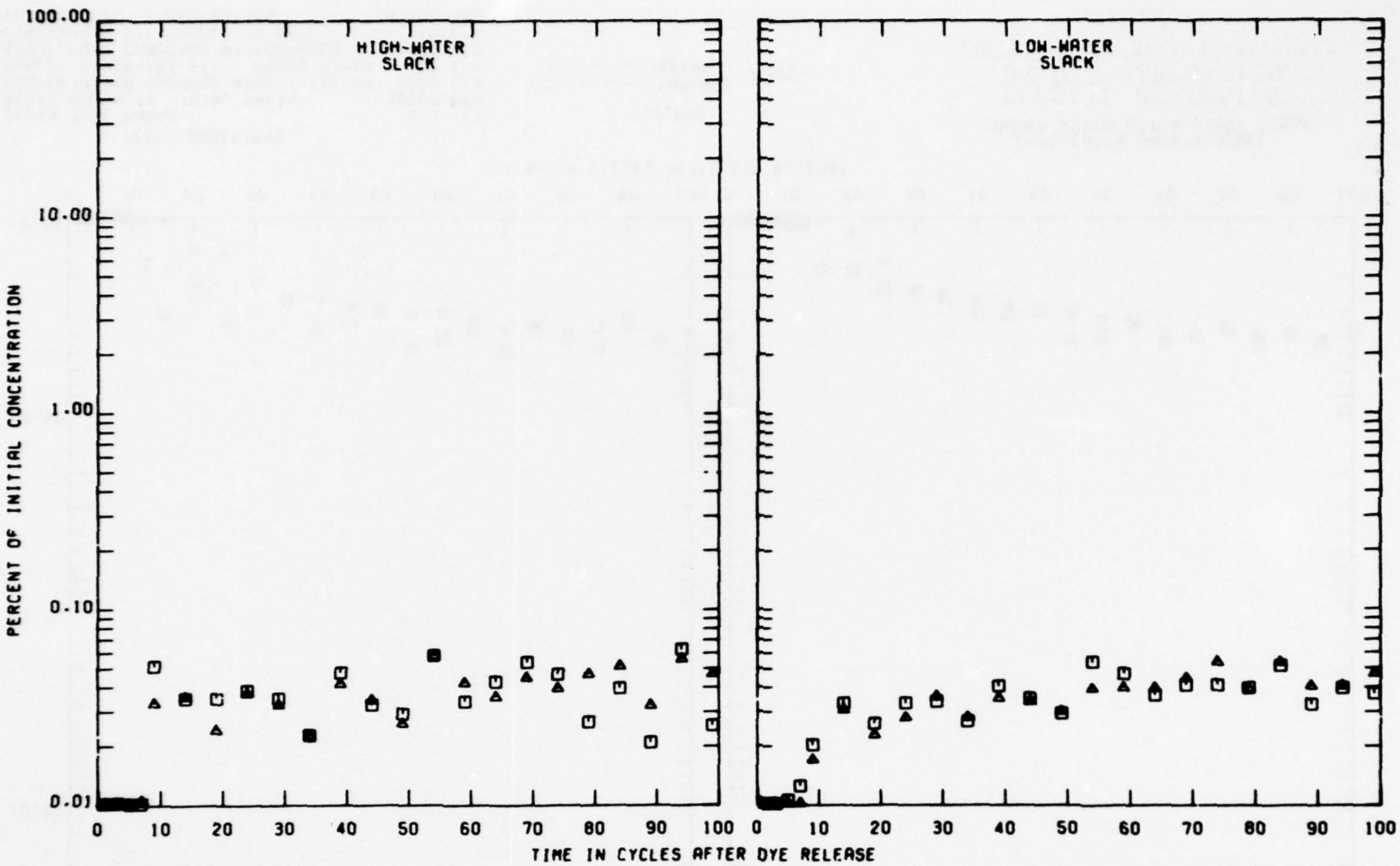
□ ——— SURFACE
▲ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 3
ON DYE DISPERSION
COOPER RIVER MILE 33 RELEASE

STATION BR1

PLATE 52



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
CONTINUOUS DYE INJECTION RATE	15	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

□ ——— SURFACE BASE
△ — — — BOTTOM

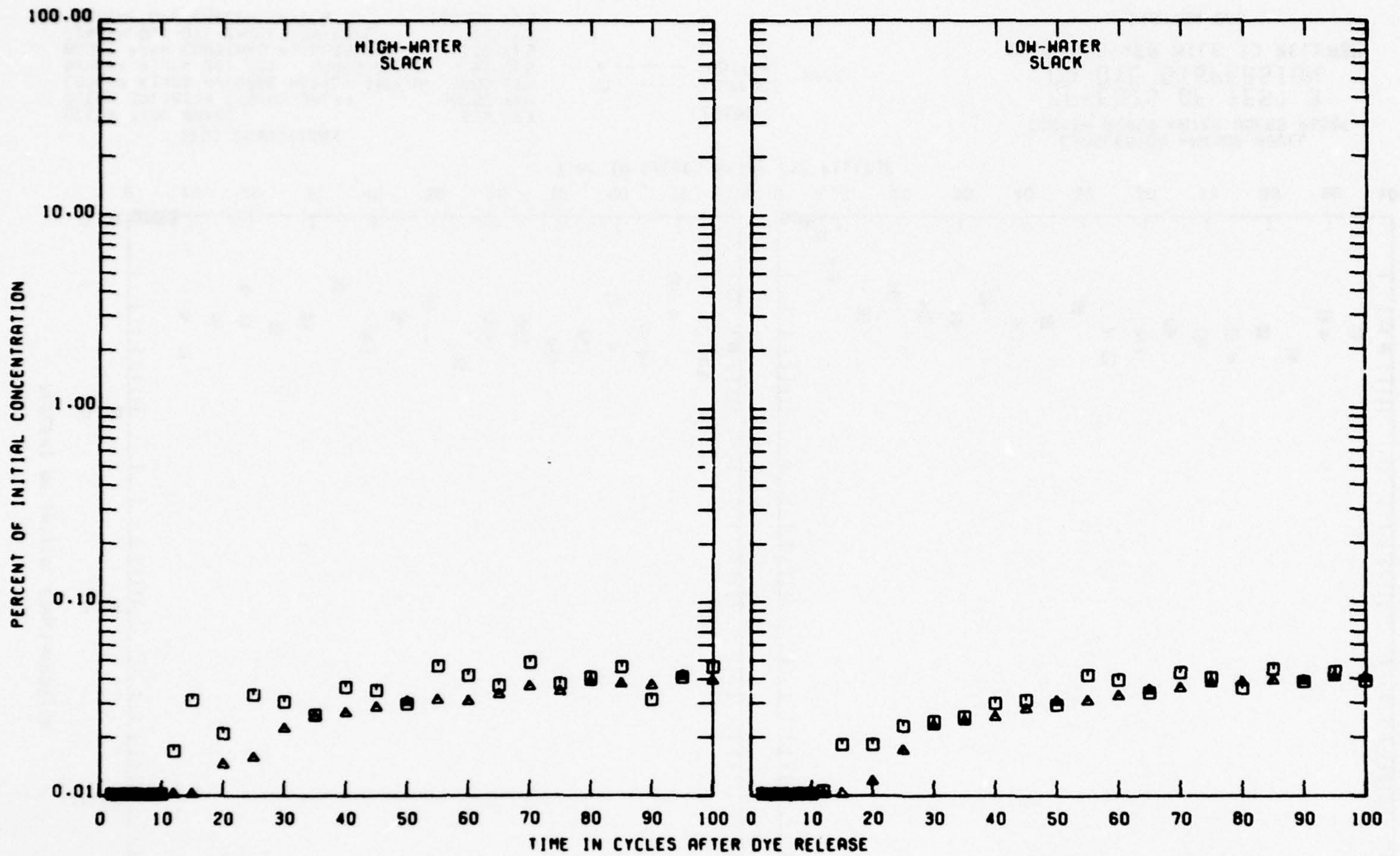
CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 3
ON DYE DISPERSION

COOPER RIVER MILE 33 RELEASE

STATION BR2

PLATE 53



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

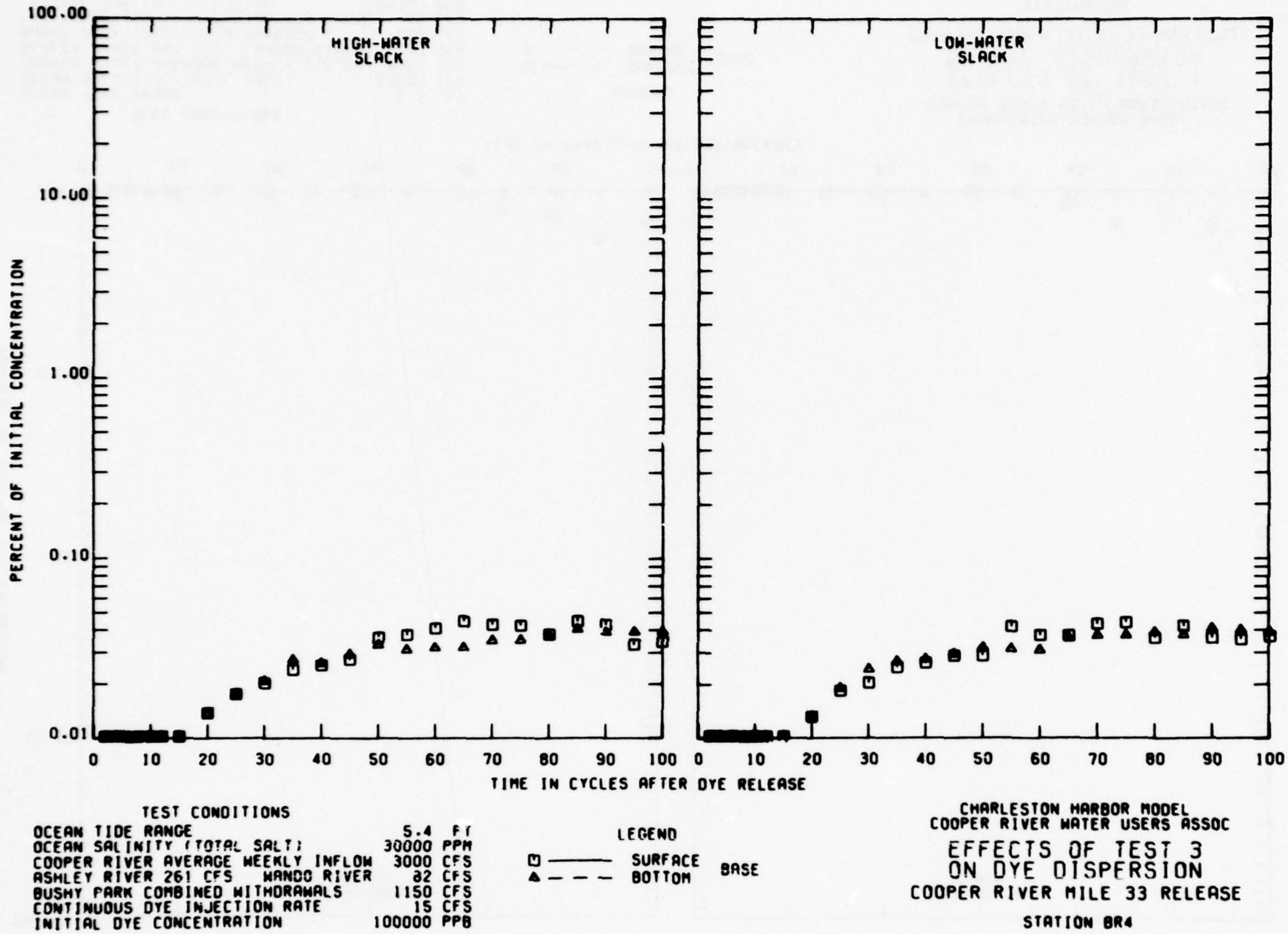
LEGEND

□ ——— SURFACE BASE
▲ — — — BOTTOM

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

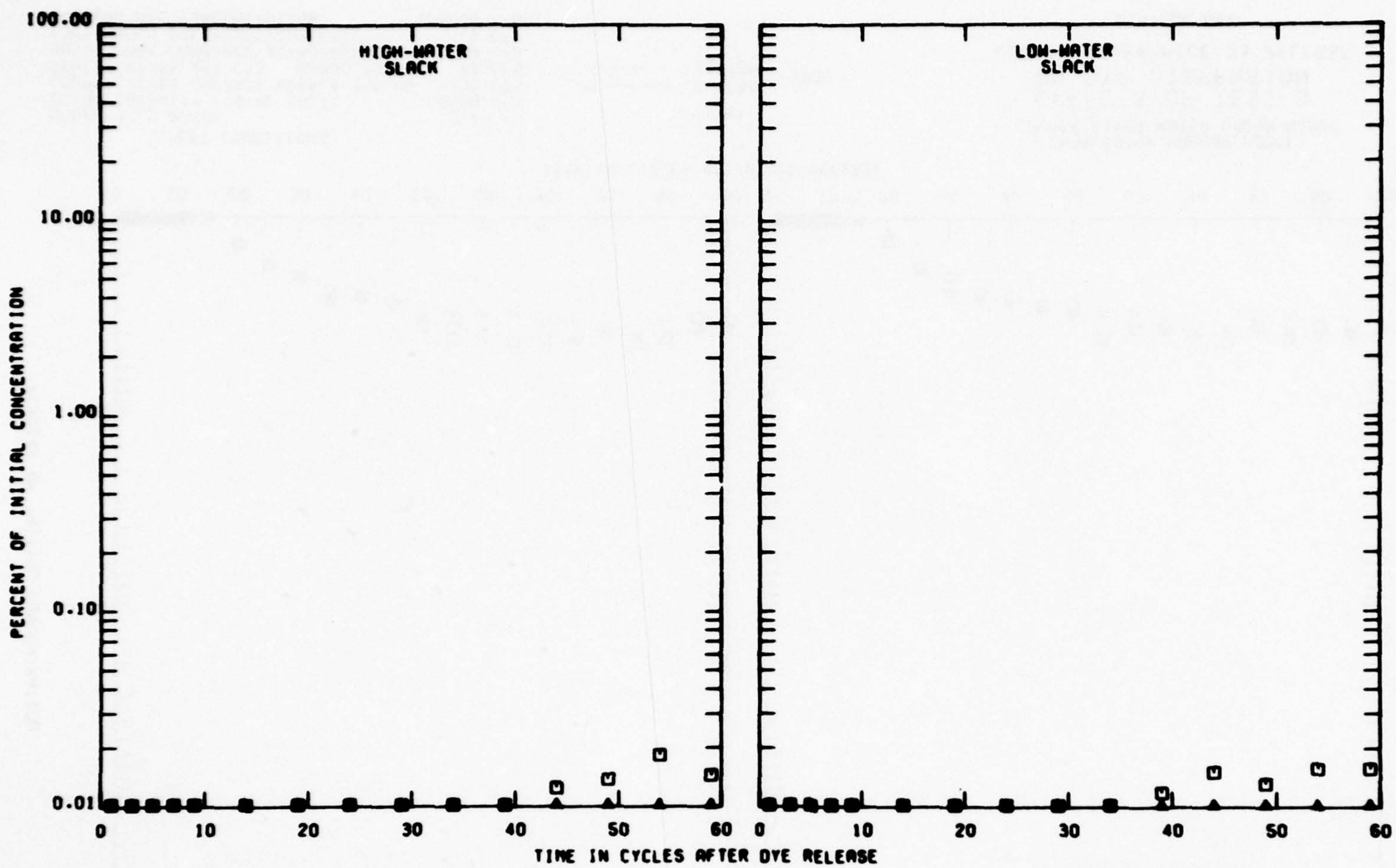
EFFECTS OF TEST 3
ON DYE DISPERSION
COOPER RIVER MILE 33 RELEASE

STATION BR3



HIGH-WATER SLACK
LOW-WATER SLACK
PERCENT OF INITIAL CONCENTRATION
100.00
10.00
1.00
0.10
0.01
0 10 20 30 40 50 60 70 80 90 100
TIME IN CYCLES AFTER DYE RELEASE
TEST CONDITIONS
OCEAN TIDE RANGE 5.4 FT
OCEAN SALINITY (TOTAL SALT) 30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW 3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER 82 CFS
BUSHY PARK COMBINED WITHDRAWALS 1150 CFS
CONTINUOUS DYE INJECTION RATE 15 CFS
INITIAL DYE CONCENTRATION 100000 PPB
LEGEND
SURFACE
BOTTOM
BASE
CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC
EFFECTS OF TEST 3
ON DYE DISPERSION
COOPER RIVER MILE 33 RELEASE
STATION BR4

PLATE 55



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
DYE INJECTION RATE DURING EBB PHASE	30 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

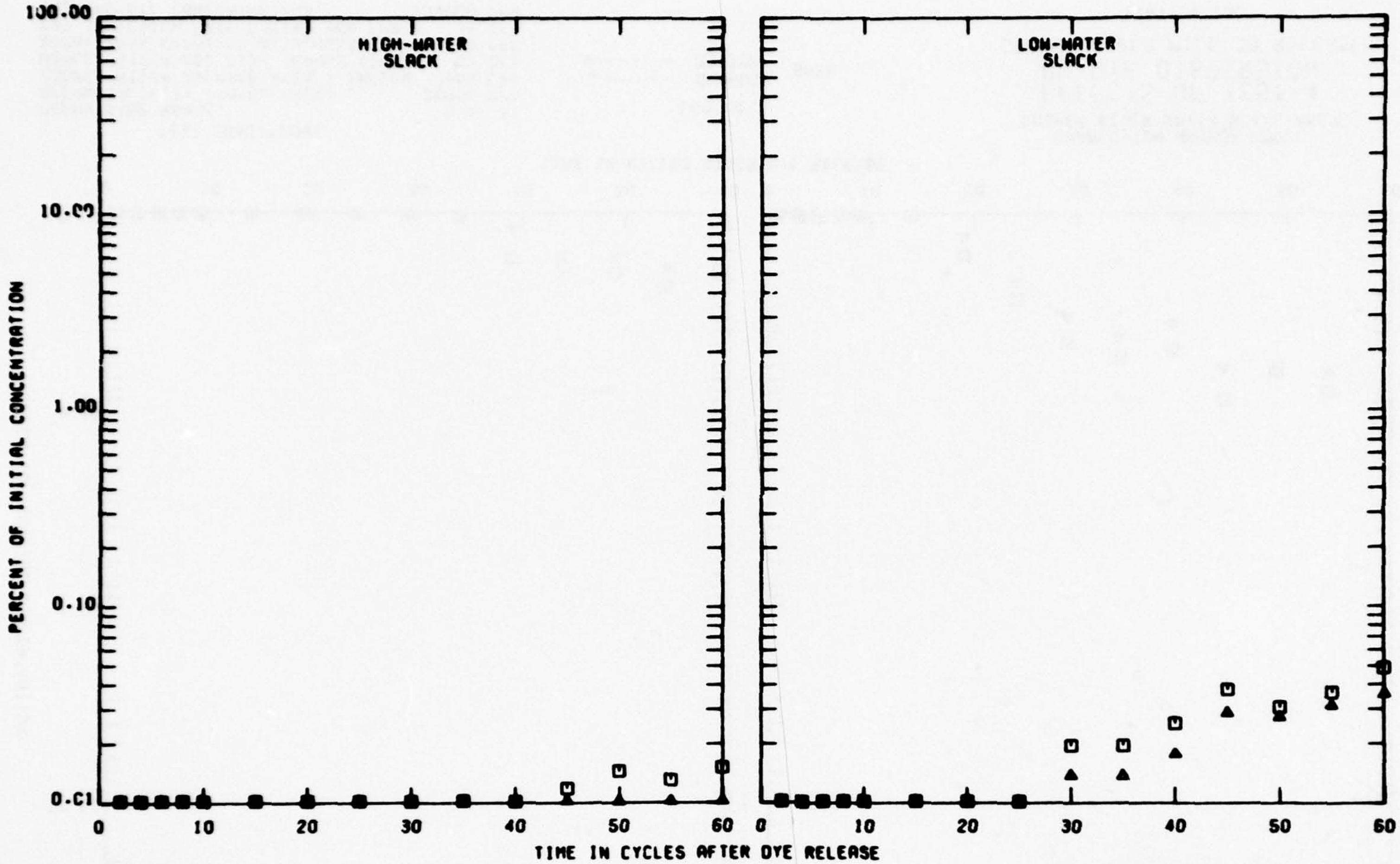
□ ——— SURFACE } BASE
▲ – – – BOTTOM

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 4
ON DYE DISPERSION

COOPER RIVER MILE 33 RELEASE

STATION OOC



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
DYE INJECTION RATE DURING EBB PHASE	30 CFS
INITIAL DYE CONCENTRATION	100000 PPB

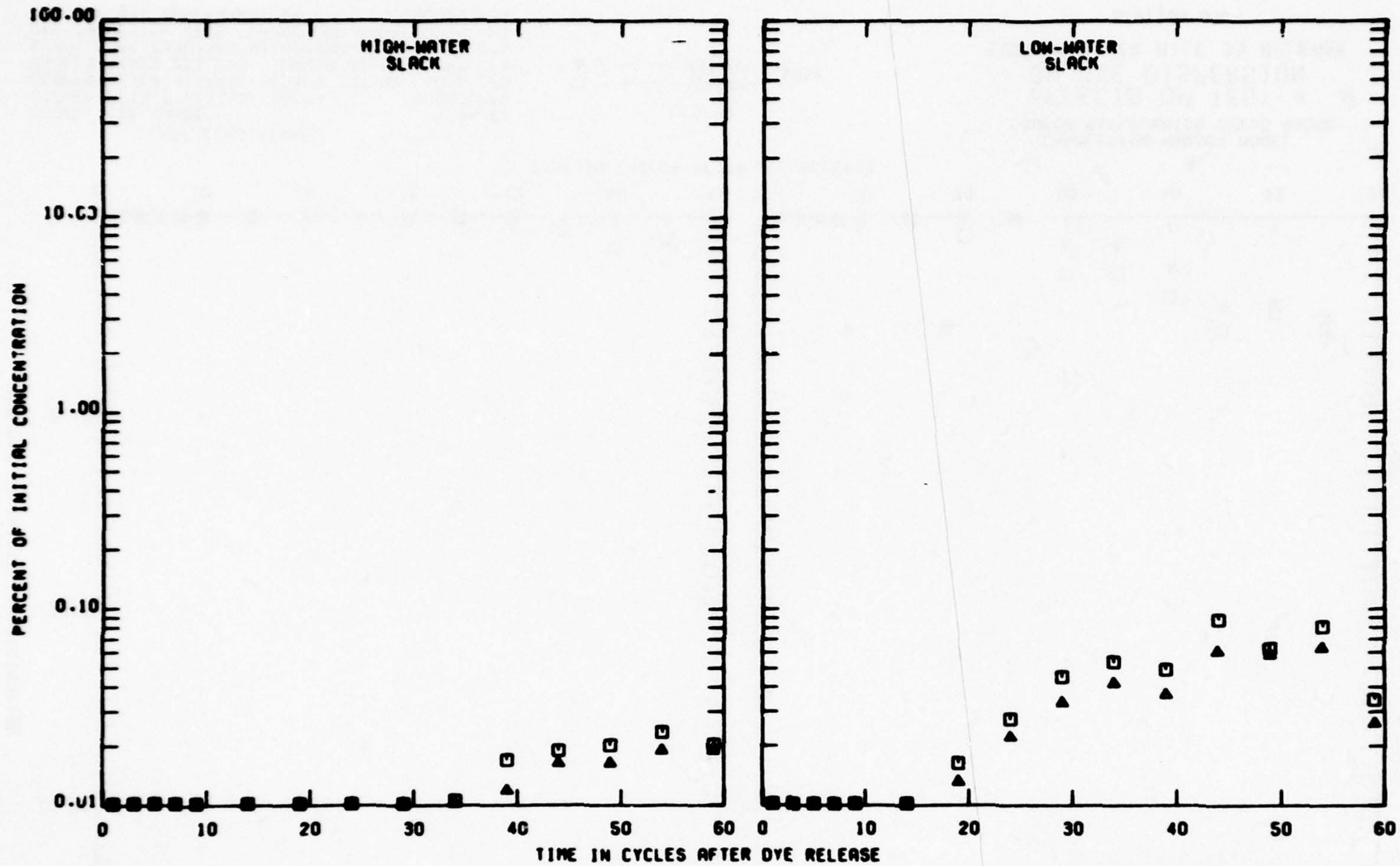
LEGEND

□ ——— SURFACE
▲ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 4
ON DYE DISPERSION
COOPER RIVER MILE 33 RELEASE

STATION OSC



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
DYE INJECTION RATE DURING EBB PHASE	30	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

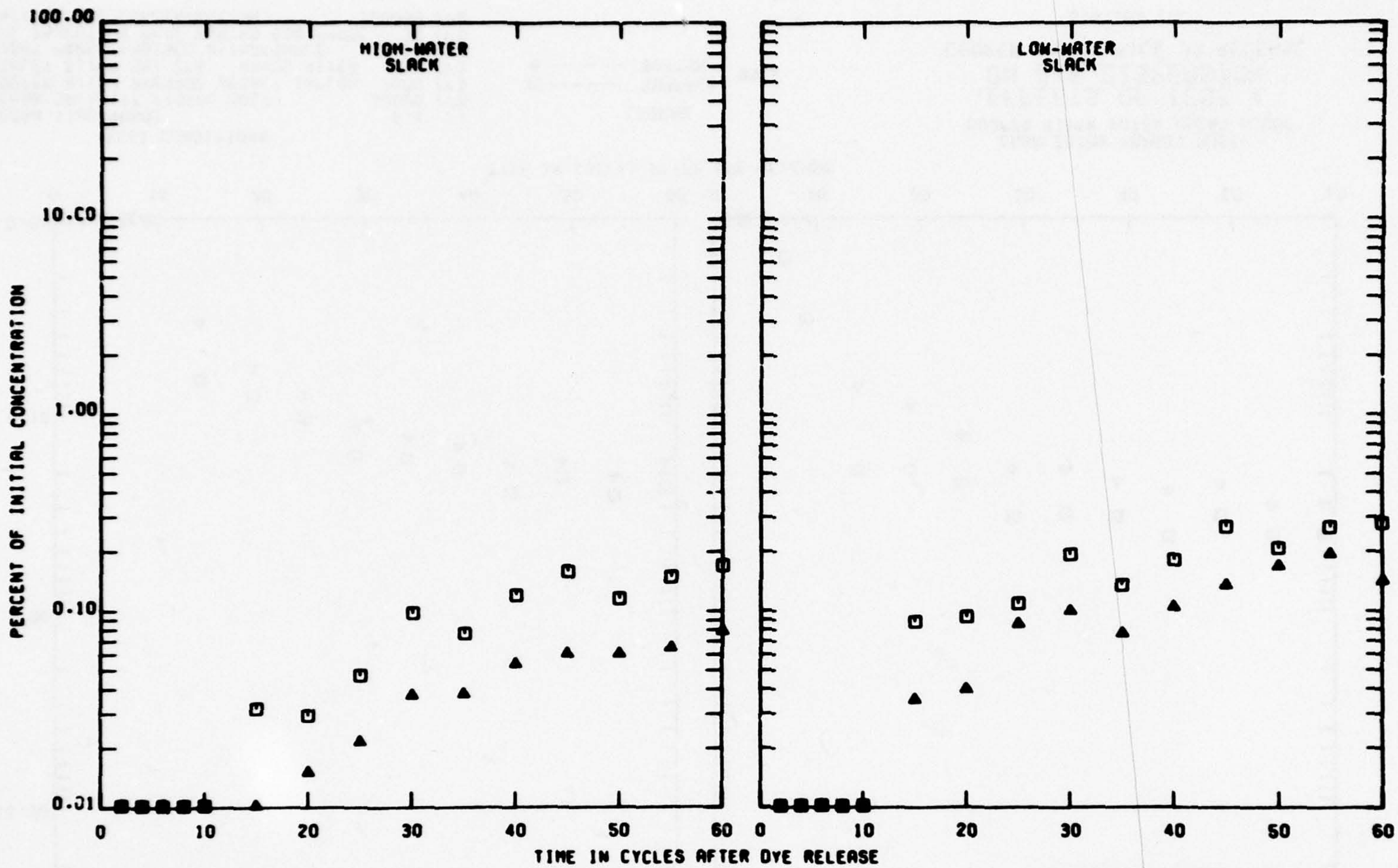
□ ——— SURFACE
▲ – – – BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 4
ON DYE DISPERSION

COOPER RIVER MILE 33 RELEASE

STATION 10C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
DYE INJECTION RATE DURING EBB PHASE	30	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

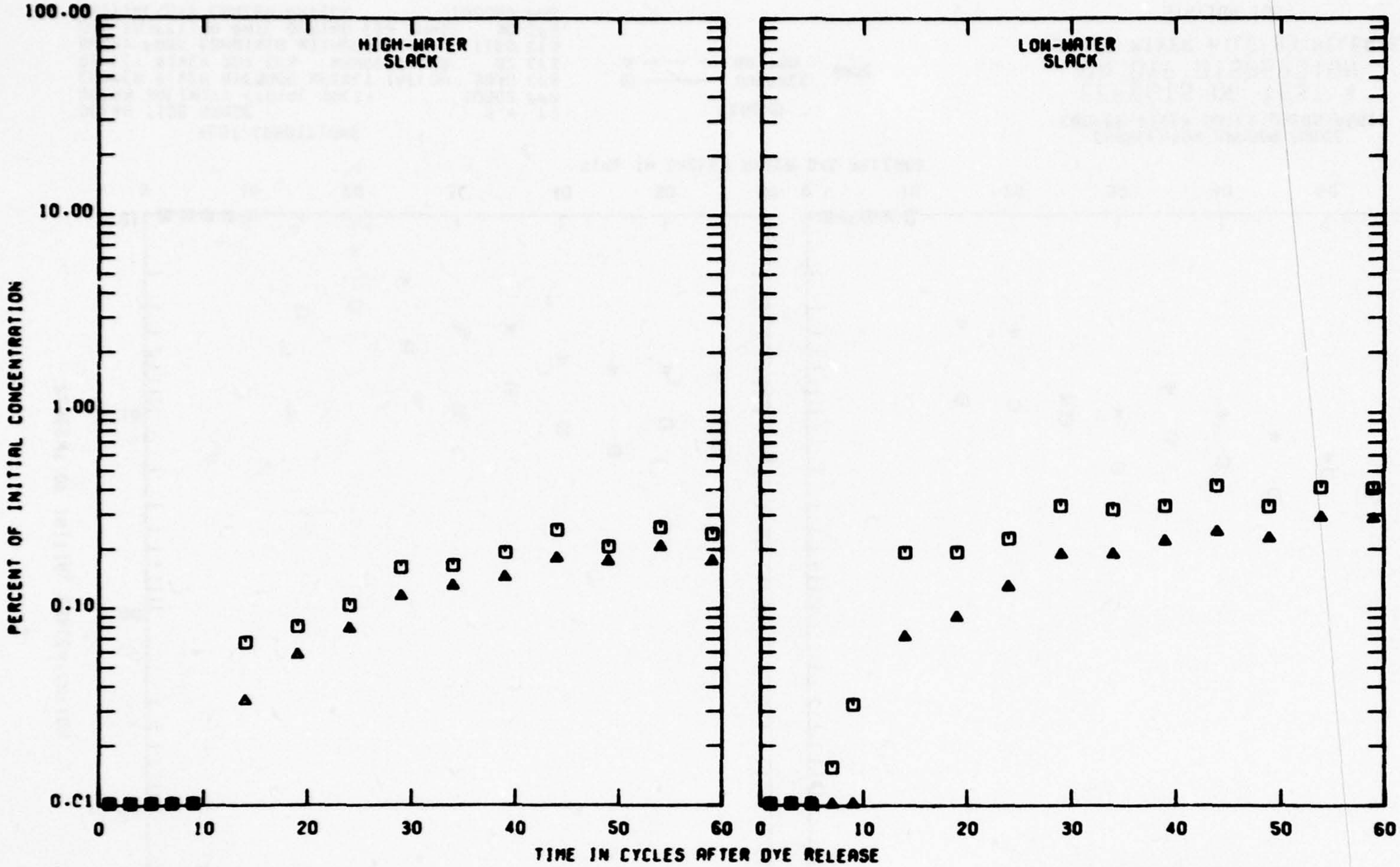
□ ——— SURFACE BASE
▲ — — — BOTTOM

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 4
ON DYE DISPERSION

COOPER RIVER MILE 33 RELEASE

STATION 15C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
DYE INJECTION RATE DURING EBB PHASE	30 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

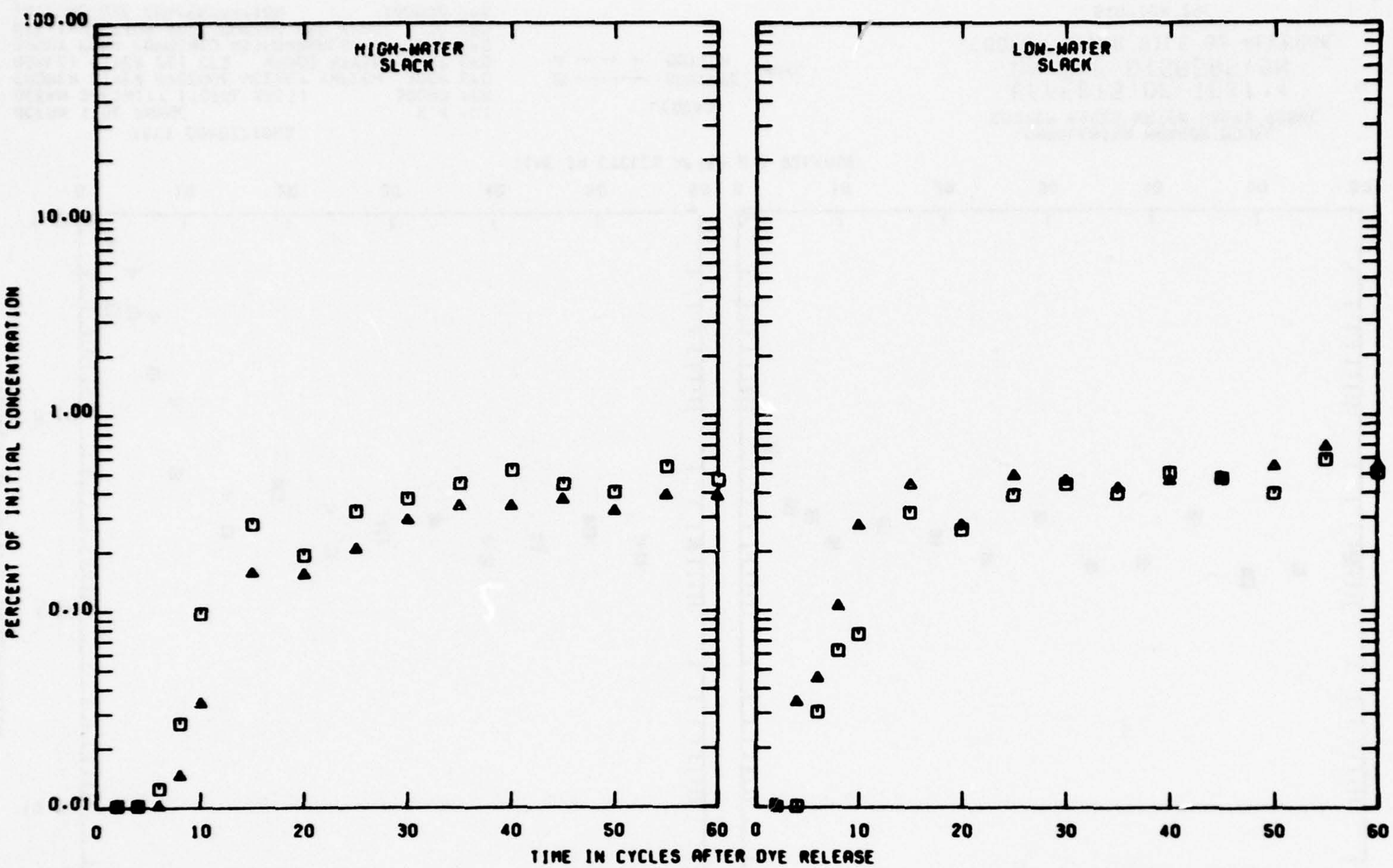
☐ ——— SURFACE
▲ – – – BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 4
ON DYE DISPERSION

COOPER RIVER MILE 33 RELEASE

STATION 20C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
DYE INJECTION RATE DURING EBB PHASE	30 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

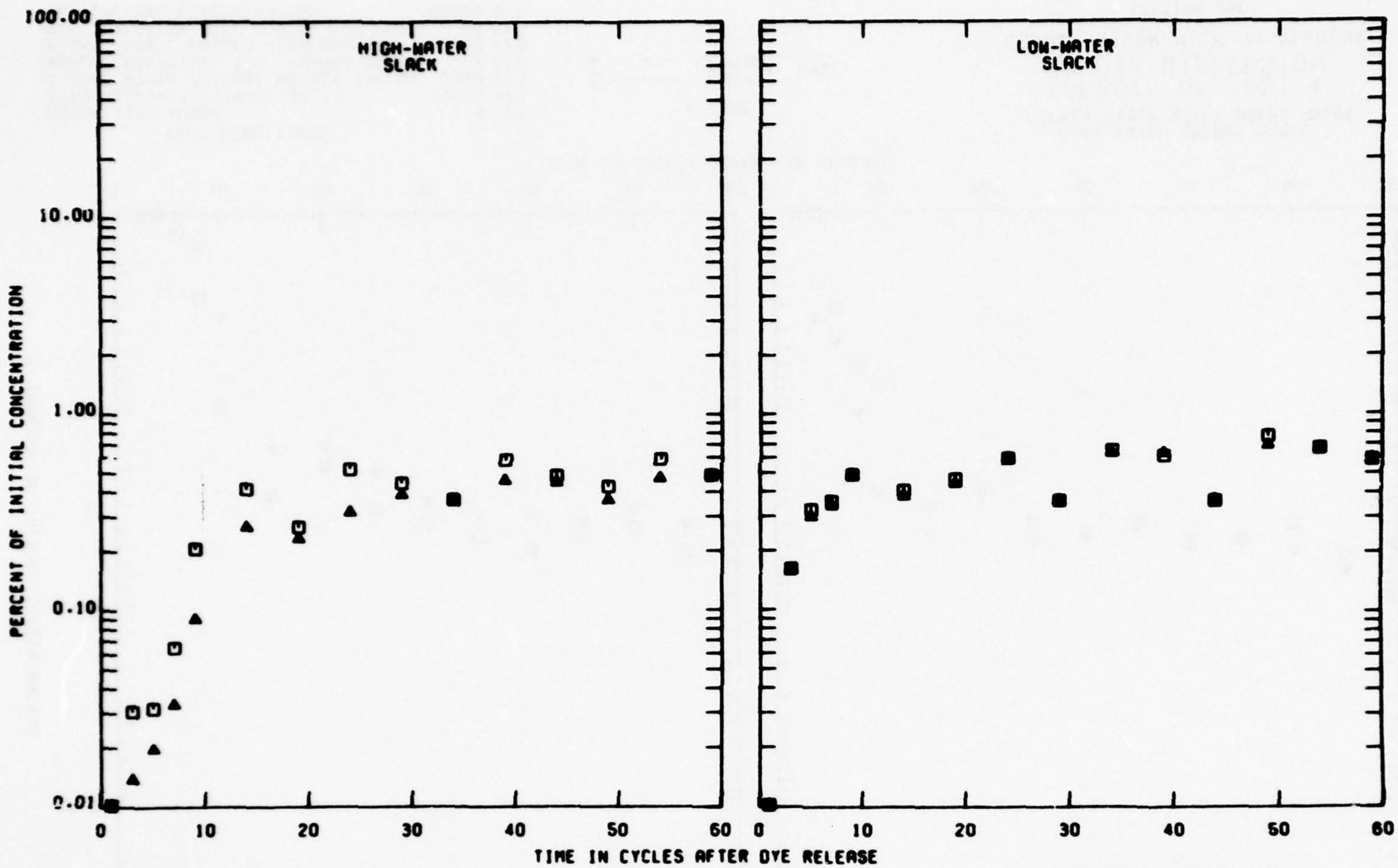
□ ——— SURFACE BASE
▲ – – – BOTTOM

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 4
ON DYE DISPERSION

COOPER RIVER MILE 33 RELEASE

STATION 25C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
DYE INJECTION RATE DURING EBB PHASE	30	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

SURFACE (square, solid line) — BASE
BOTTOM (triangle, dashed line) — BASE

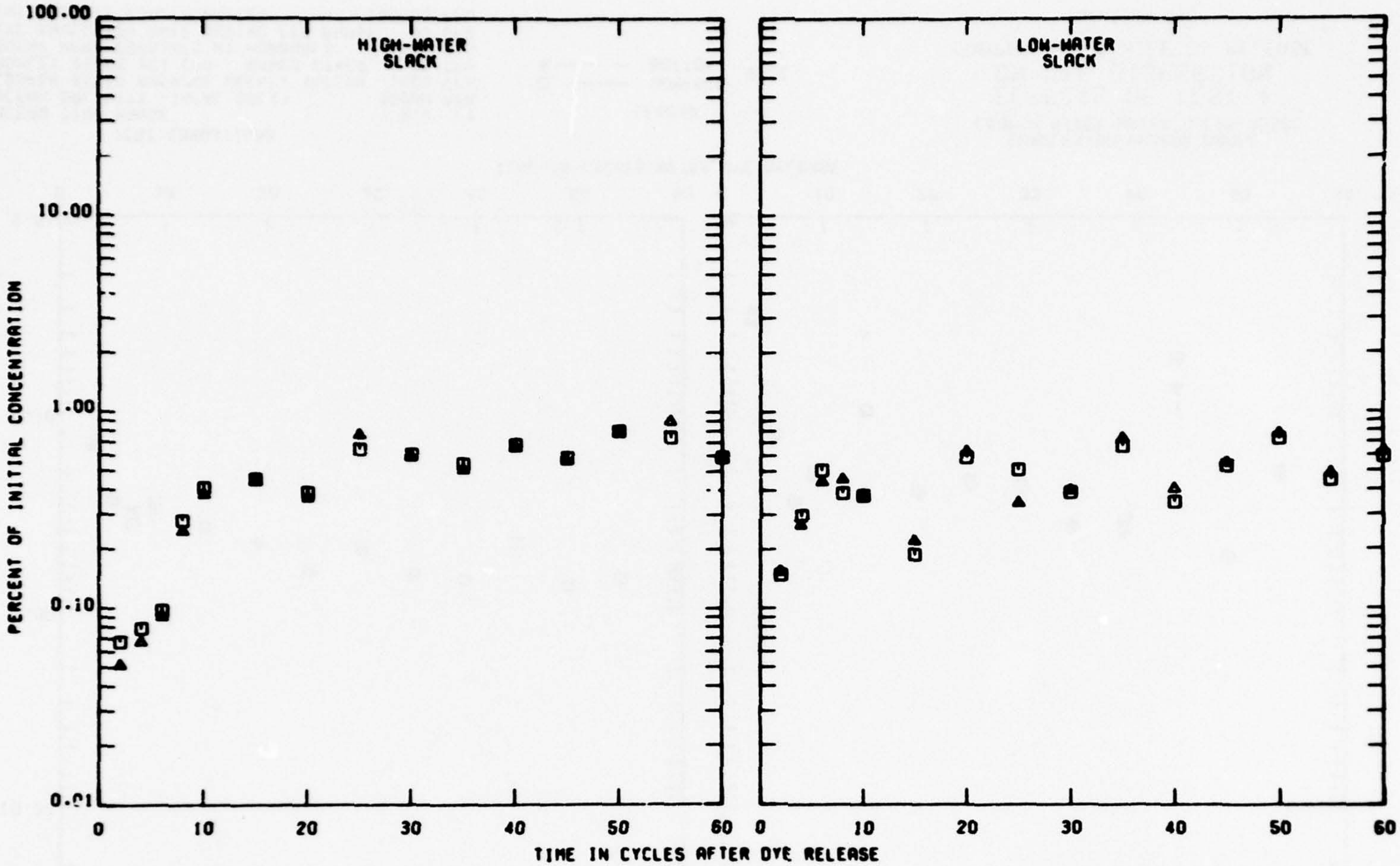
CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 4
ON DYE DISPERSION

COOPER RIVER MILE 33 RELEASE

STATION 29C

PLATE 62



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
DYE INJECTION RATE DURING EBB PHASE	30	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

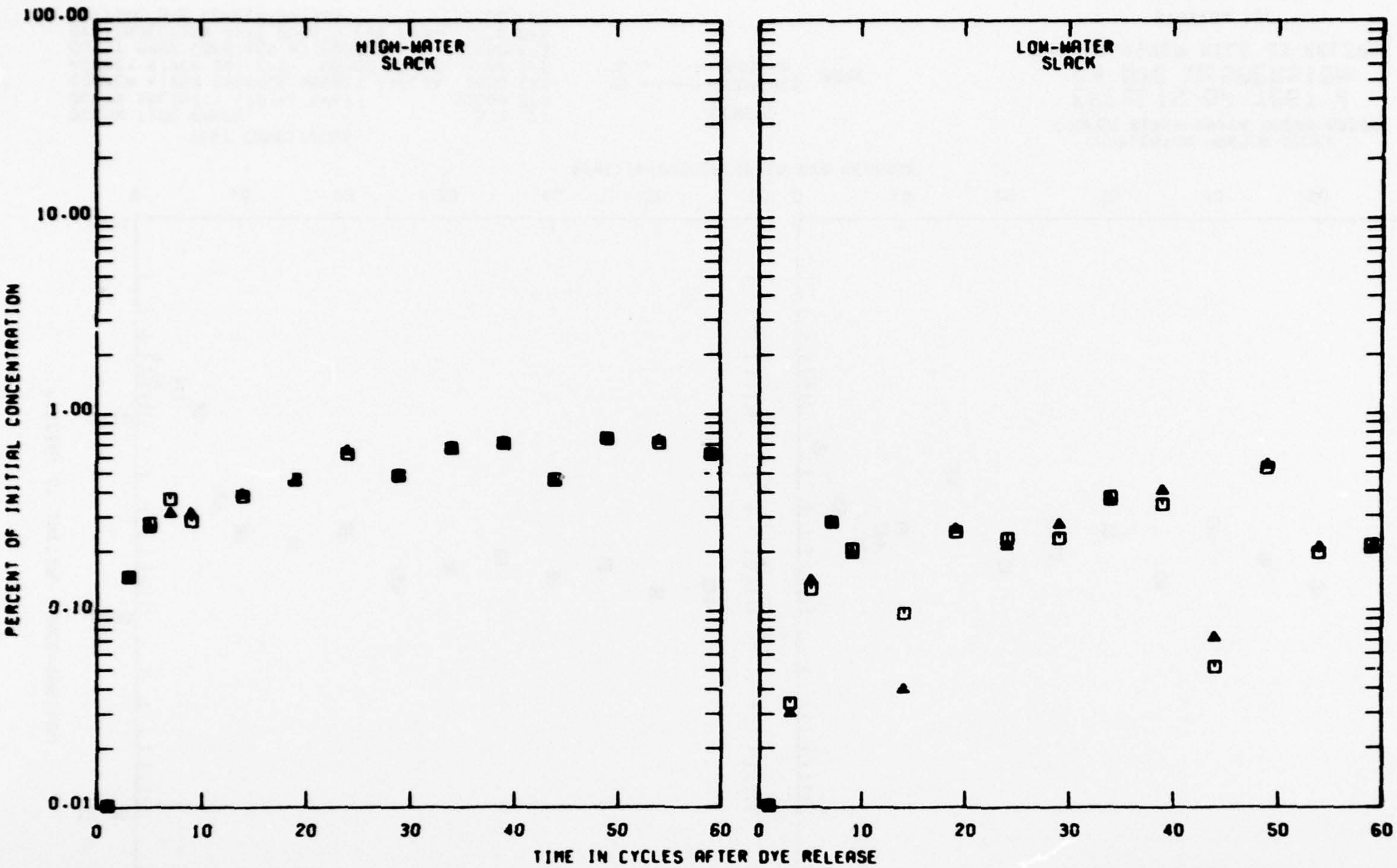
□ ——— SURFACE
▲ – – – BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 4
ON DYE DISPERSION

COOPER RIVER MILE 33 RELEASE

STATION 32C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
DYE INJECTION RATE DURING EBB PHASE	30	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

□ ——— SURFACE BASE
▲ — — — BOTTOM

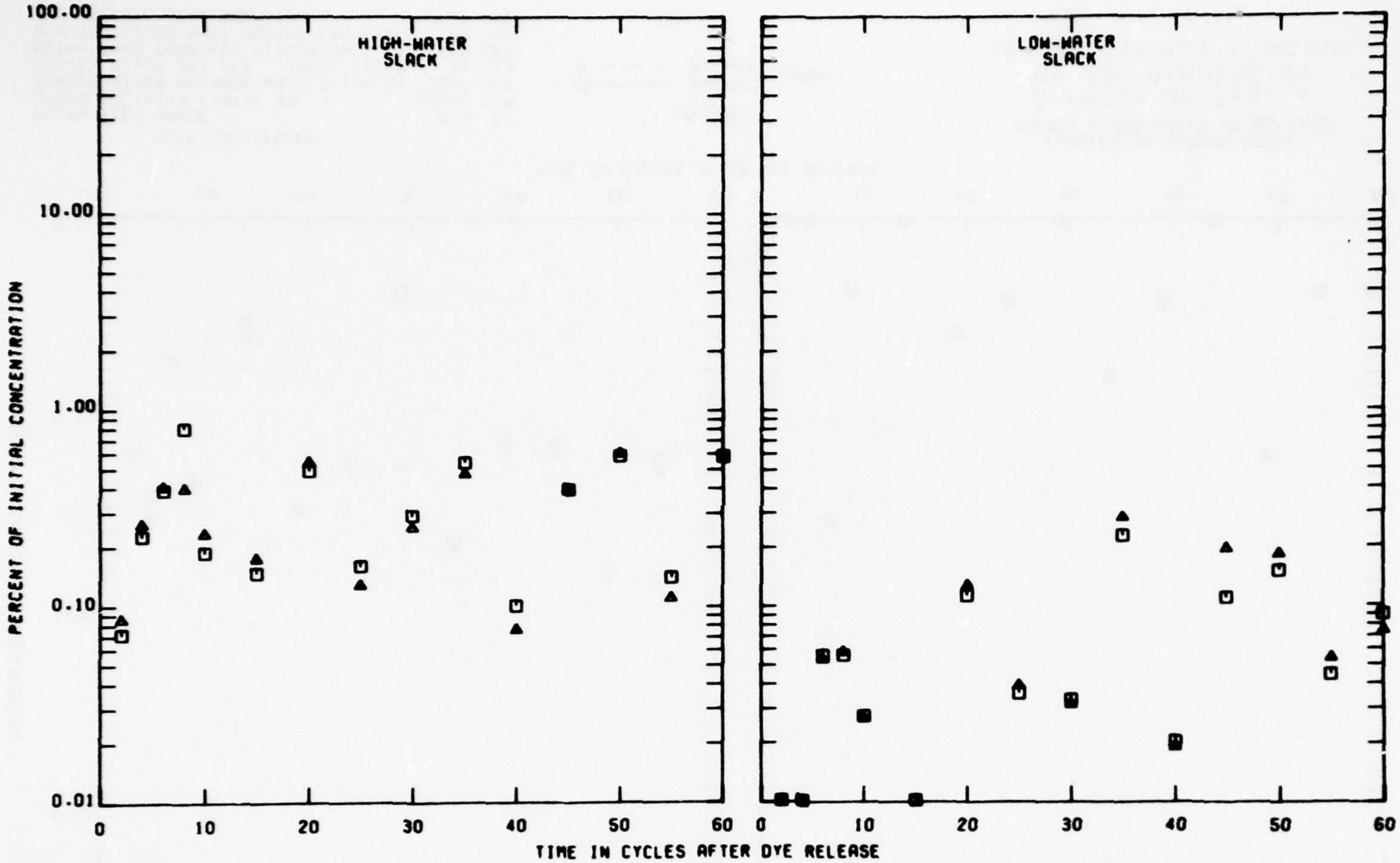
CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 4
ON DYE DISPERSION

COOPER RIVER MILE 33 RELEASE

STATION 34C

PLATE 64



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
DYE INJECTION RATE DURING EBB PHASE	30 CFS
INITIAL DYE CONCENTRATION	10000C PPB

LEGEND

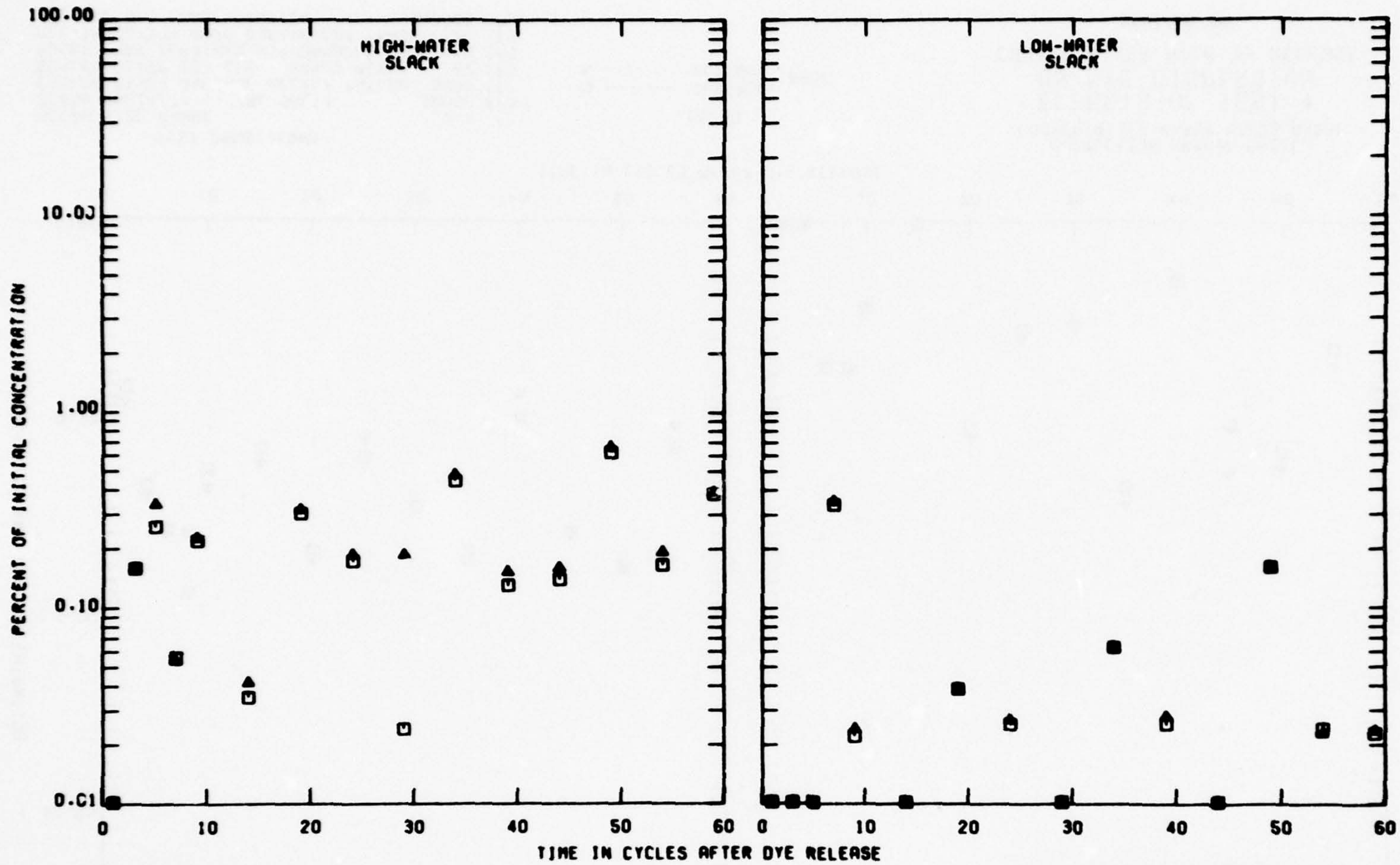
□ ——— SURFACE
▲ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 4
ON DYE DISPERSION

COOPER RIVER MILE 33 RELEASE

STATION 38C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
DYE INJECTION RATE DURING EBB PHASE	30	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

BASE

□ ——— SURFACE

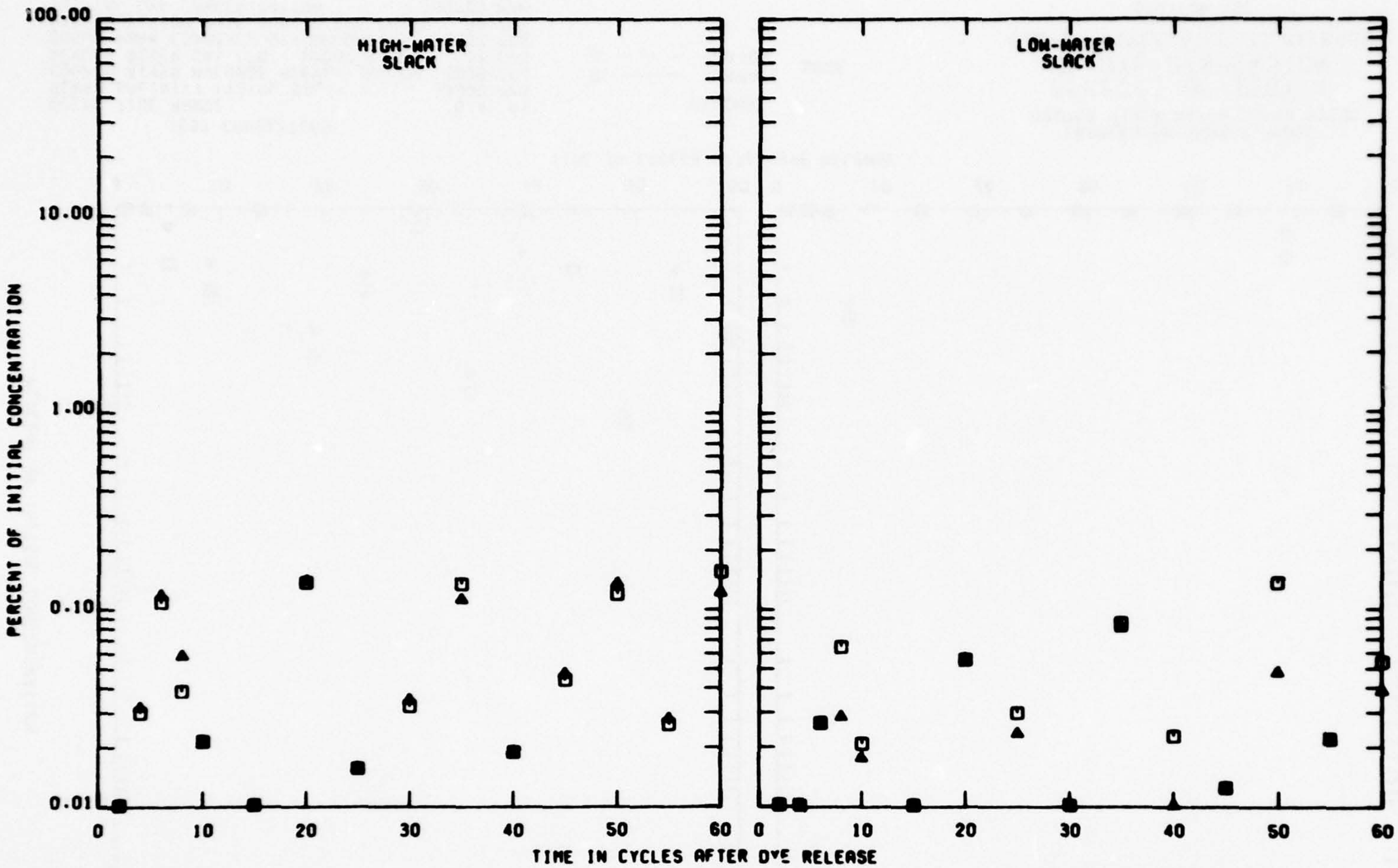
▲ — — — BOTTOM

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 4
ON DYE DISPERSION

COOPER RIVER MILE 33 RELEASE

STATION TEE



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
DYE INJECTION RATE DURING EBB PHASE	30	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

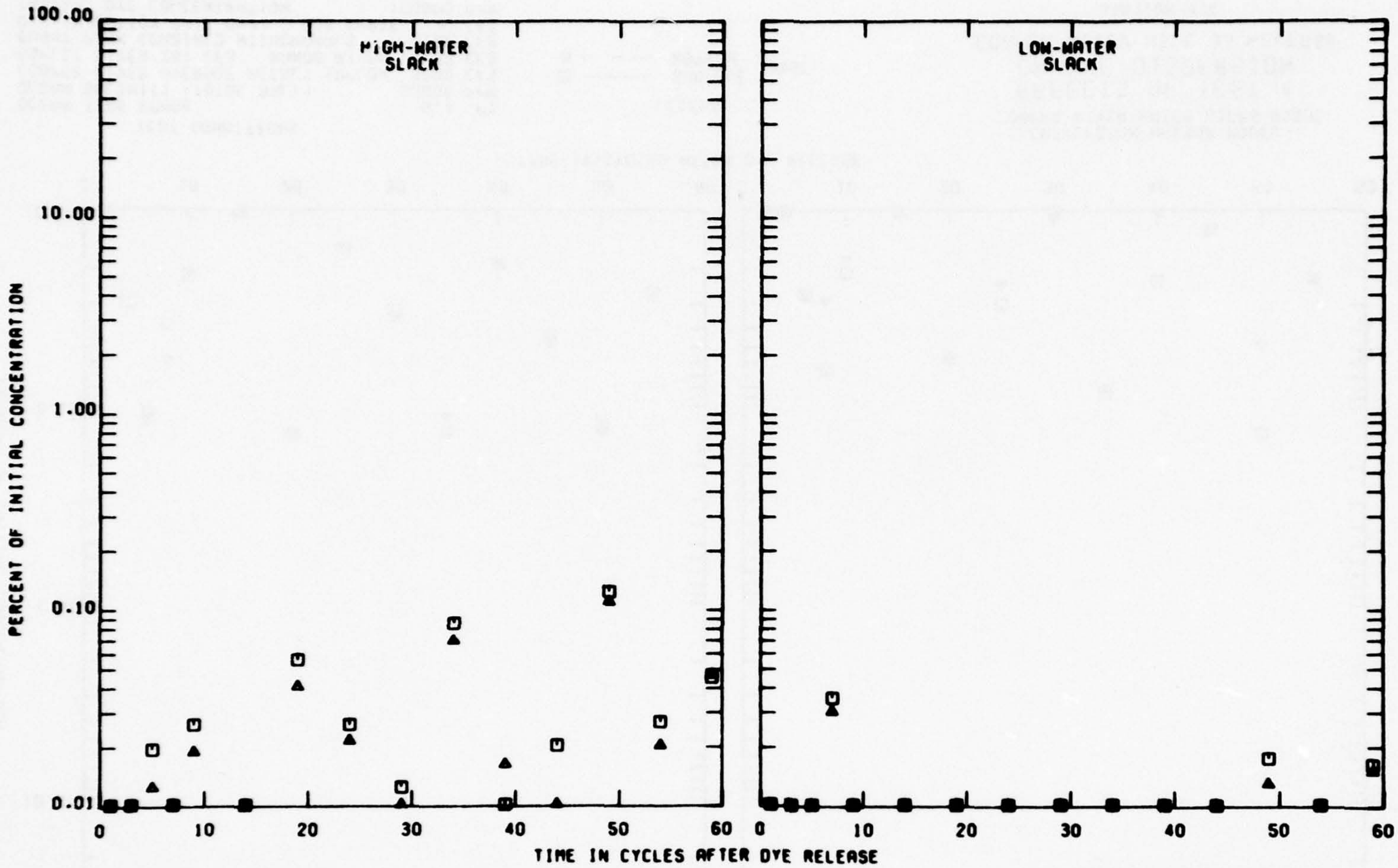
□ ——— SURFACE
▲ — — — BOTTOM

BASF

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 4
ON DYE DISPERSION
COOPER RIVER MILE 33 RELEASE

STATION 43C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
DYE INJECTION RATE DURING EBB PHASE	30	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

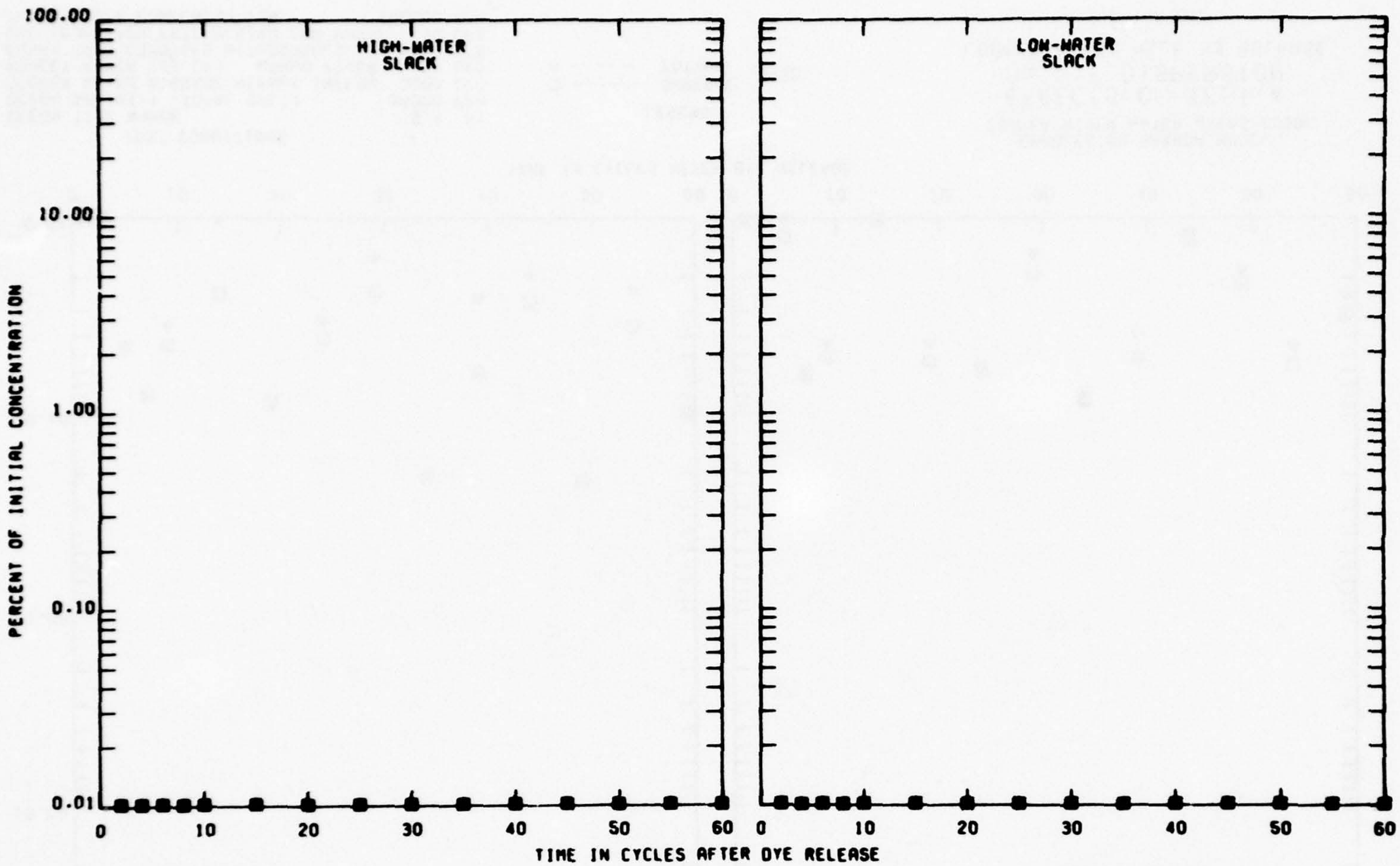
□ ——— SURFACE
▲ – – – BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 4
ON DYE DISPERSION

COOPER RIVER MILE 33 RELEASE

STATION 45C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
DYE INJECTION RATE DURING EBB PHASE	30	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

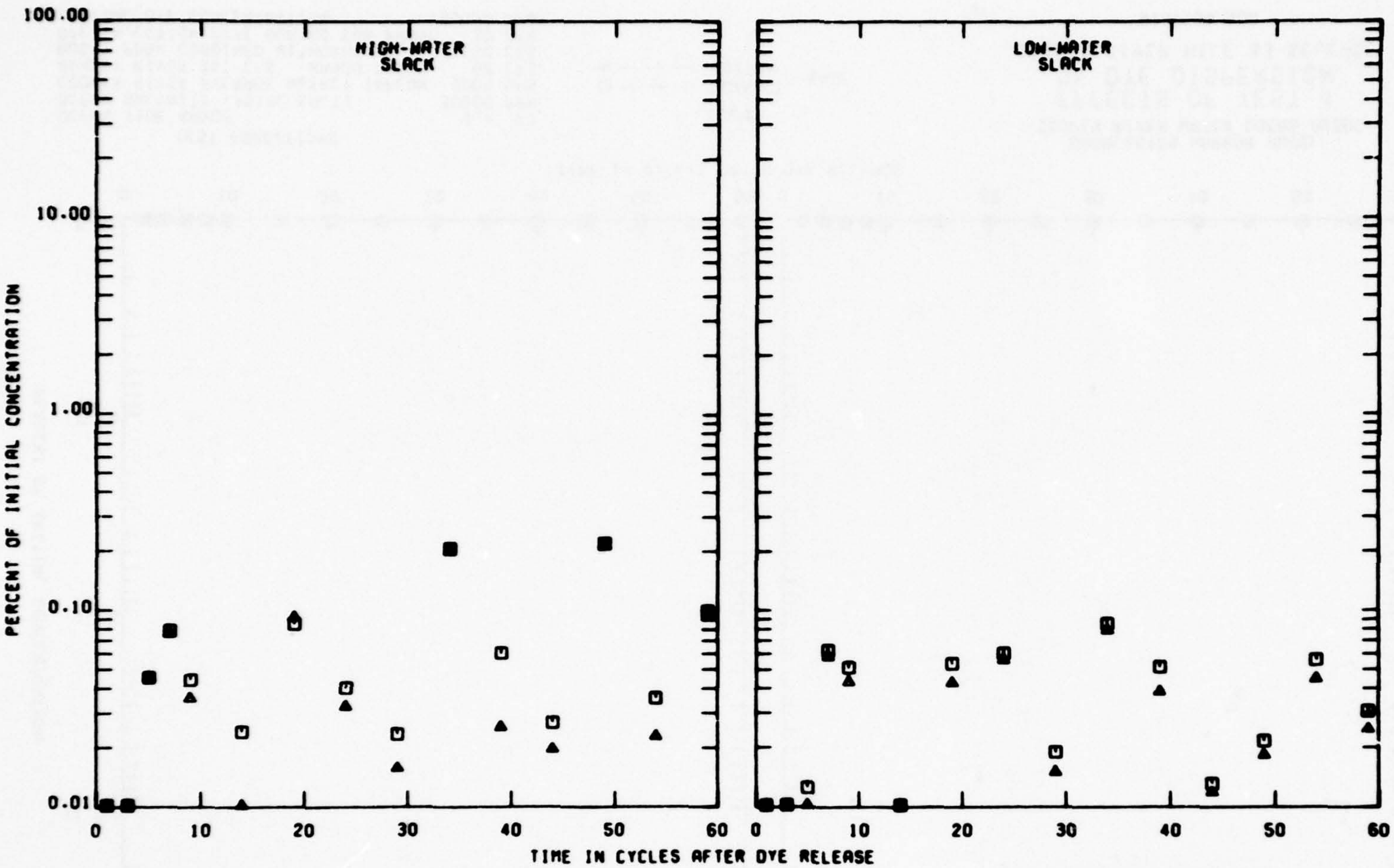
☐ ——— SURFACE
▲ – – – BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 4
ON DYE DISPERSION

COOPER RIVER MILE 33 RELEASE

STATION SOC



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
DYE INJECTION RATE DURING EBB PHASE	30	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

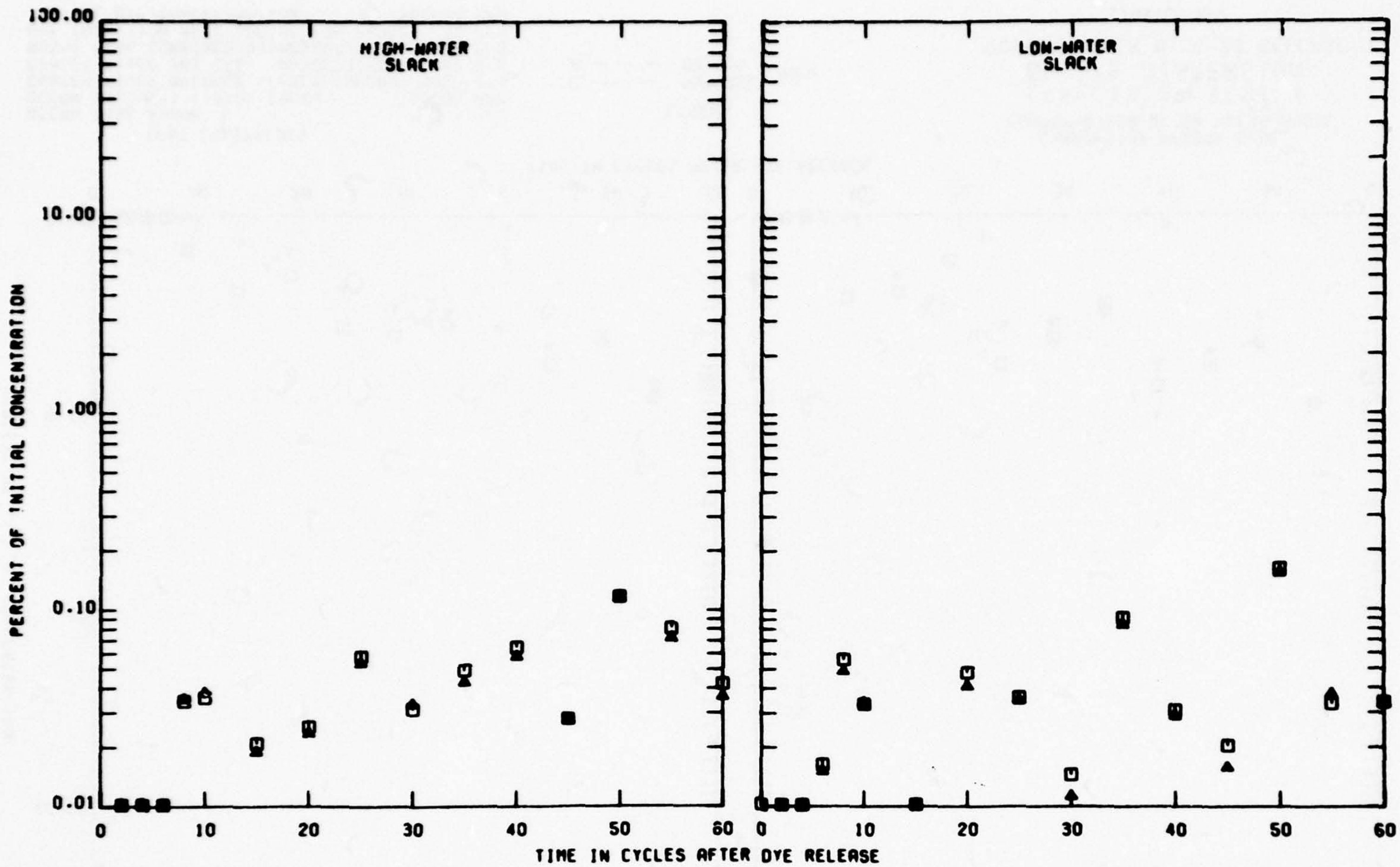
▢ ——— SURFACE BASE
▲ – – – BOTTOM

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 4
ON DYE DISPERSION
COOPER RIVER MILE 33 RELEASE

STATION BRC

PLATE 70



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
DYE INJECTION RATE DURING EBB PHASE	30	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

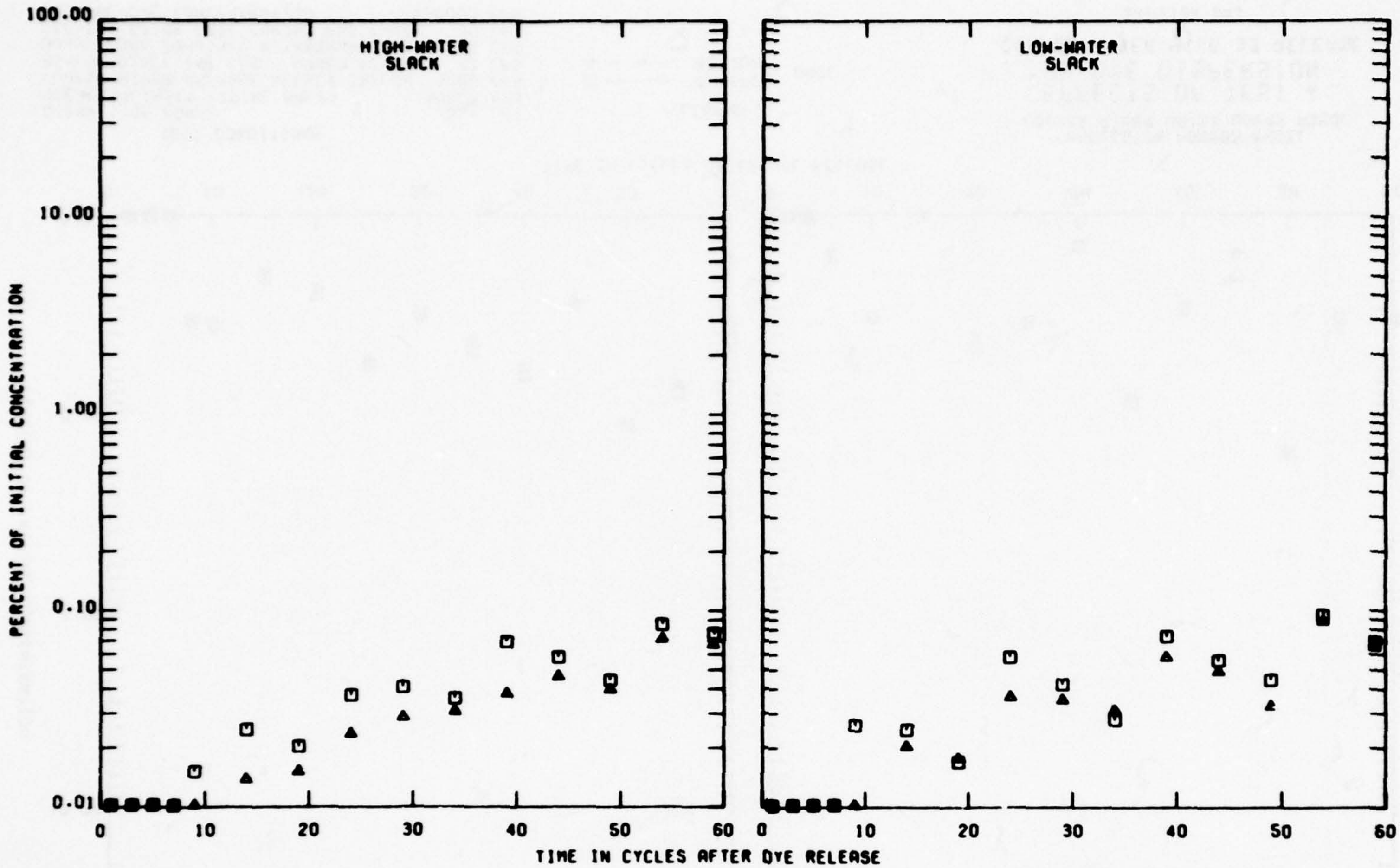
□ ——— SURFACE
▲ – – – BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 4
ON DYE DISPERSION

COOPER RIVER MILE 33 RELEASE

STATION BR1



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
DYE INJECTION RATE DURING EBB PHASE	30	CFS
INITIAL DYE CONCENTRATION	100000	PPB

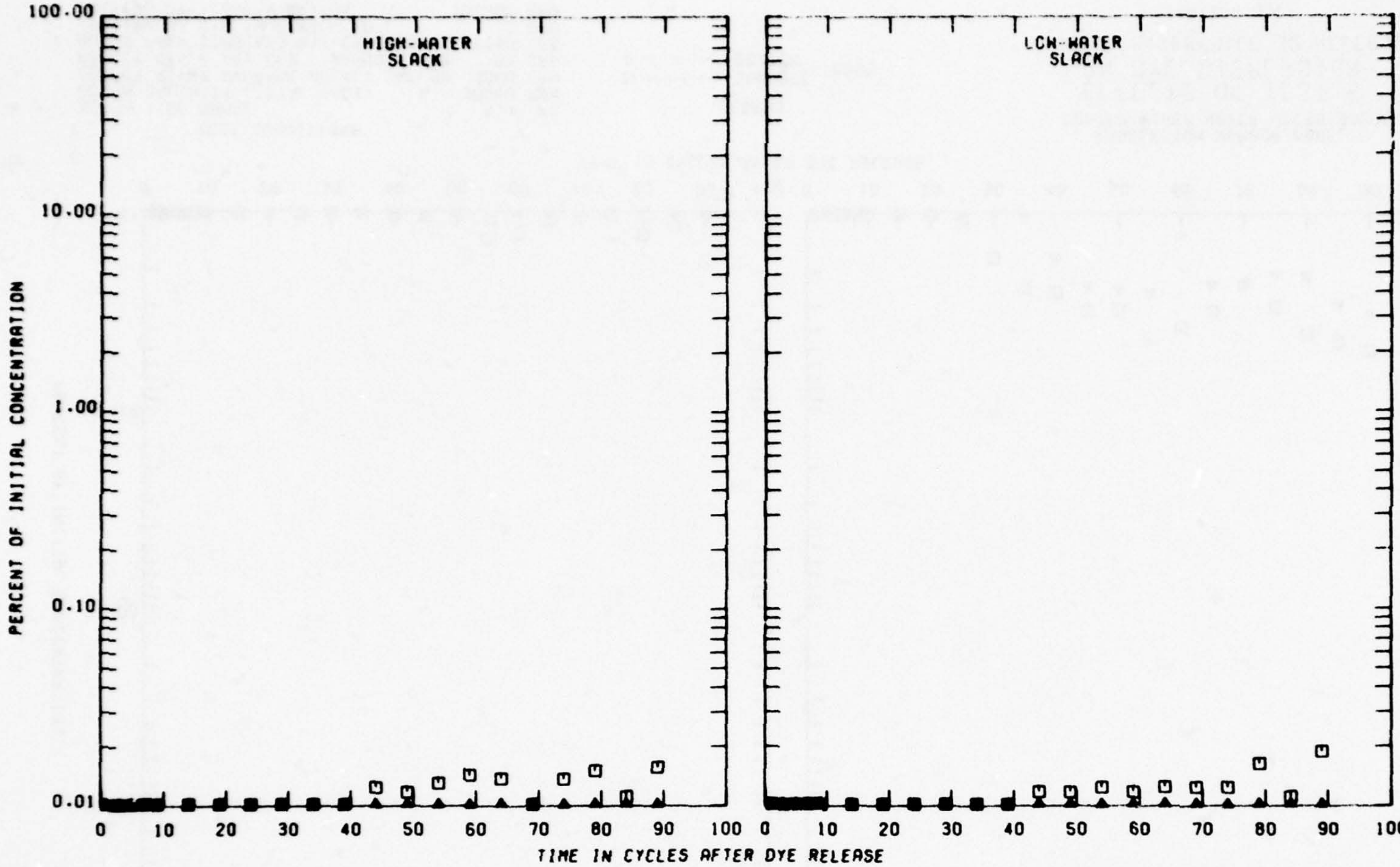
LEGEND

▢ ——— SURFACE BASE
▲ – – – BOTTOM

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 4
ON DYE DISPERSION
COOPER RIVER MILE 33 RELEASE

STATION BR2



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

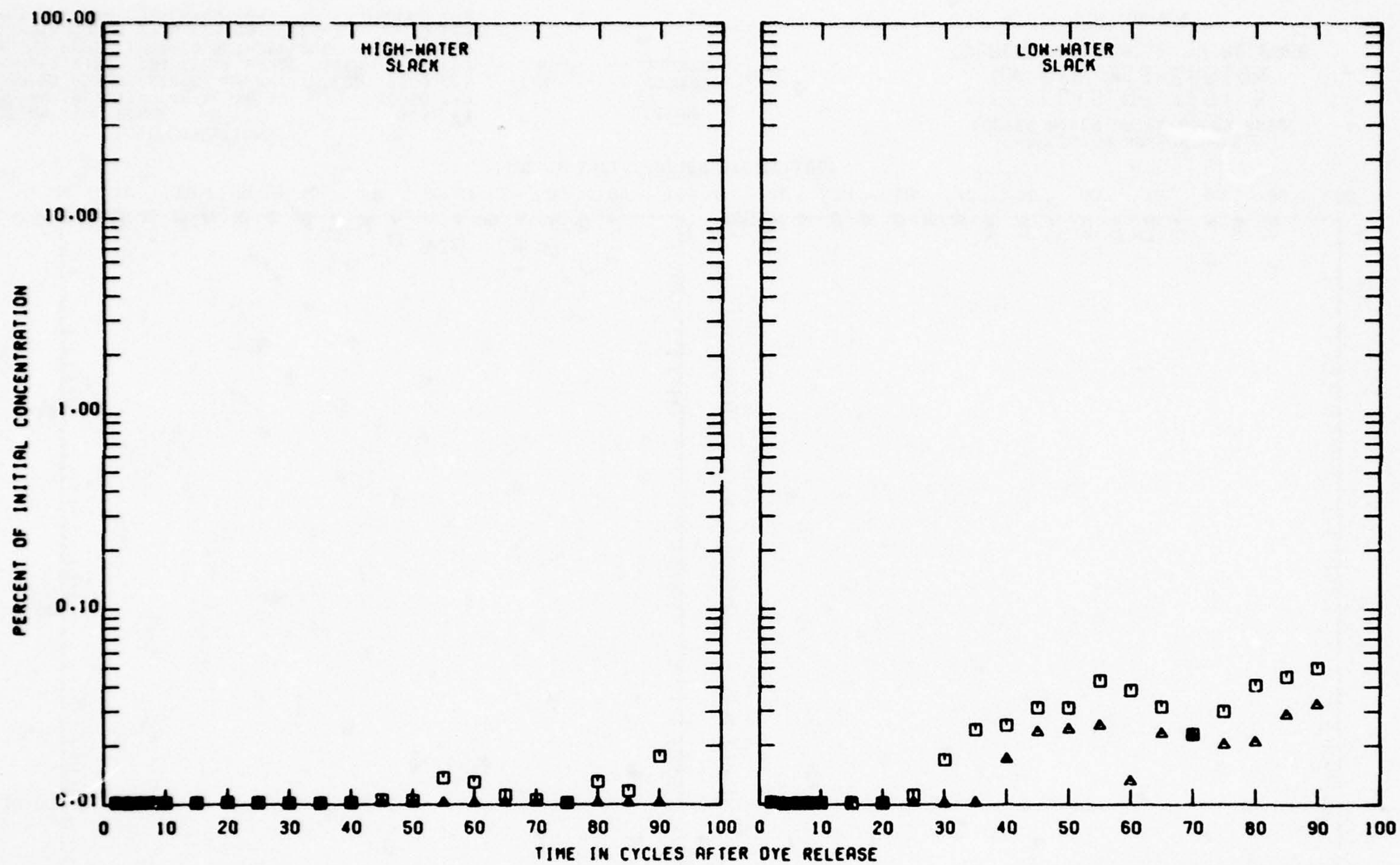
□ ——— SURFACE
▲ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 5
ON DYE DISPERSION

COOPER RIVER MILE 30 RELEASE

STATION 00C



TEST CONDITIONS	
OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

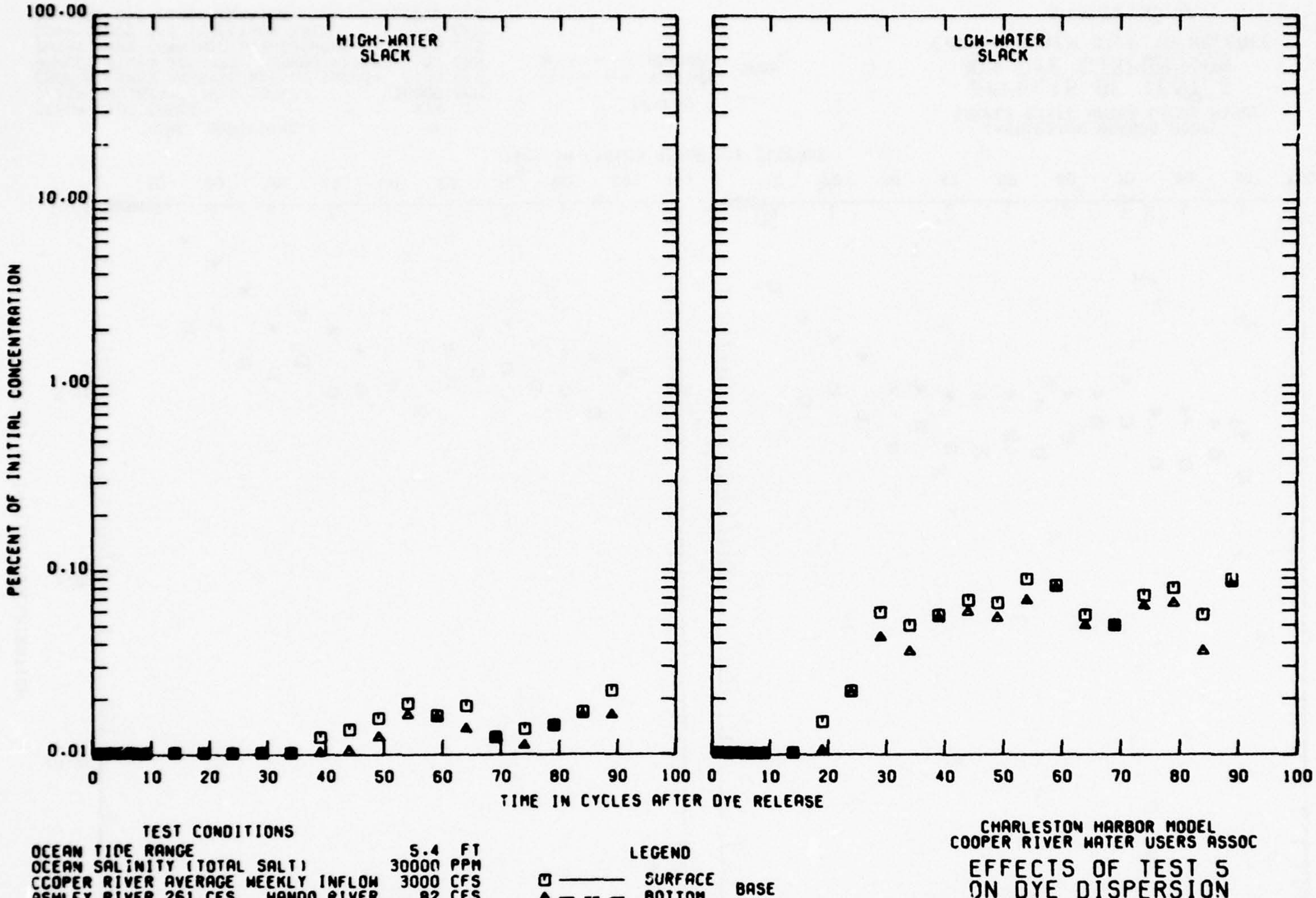
LEGEND

□ ——— SURFACE
△ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 5
ON DYE DISPERSION
COOPER RIVER MILE 30 RELEASE

STATION OSC



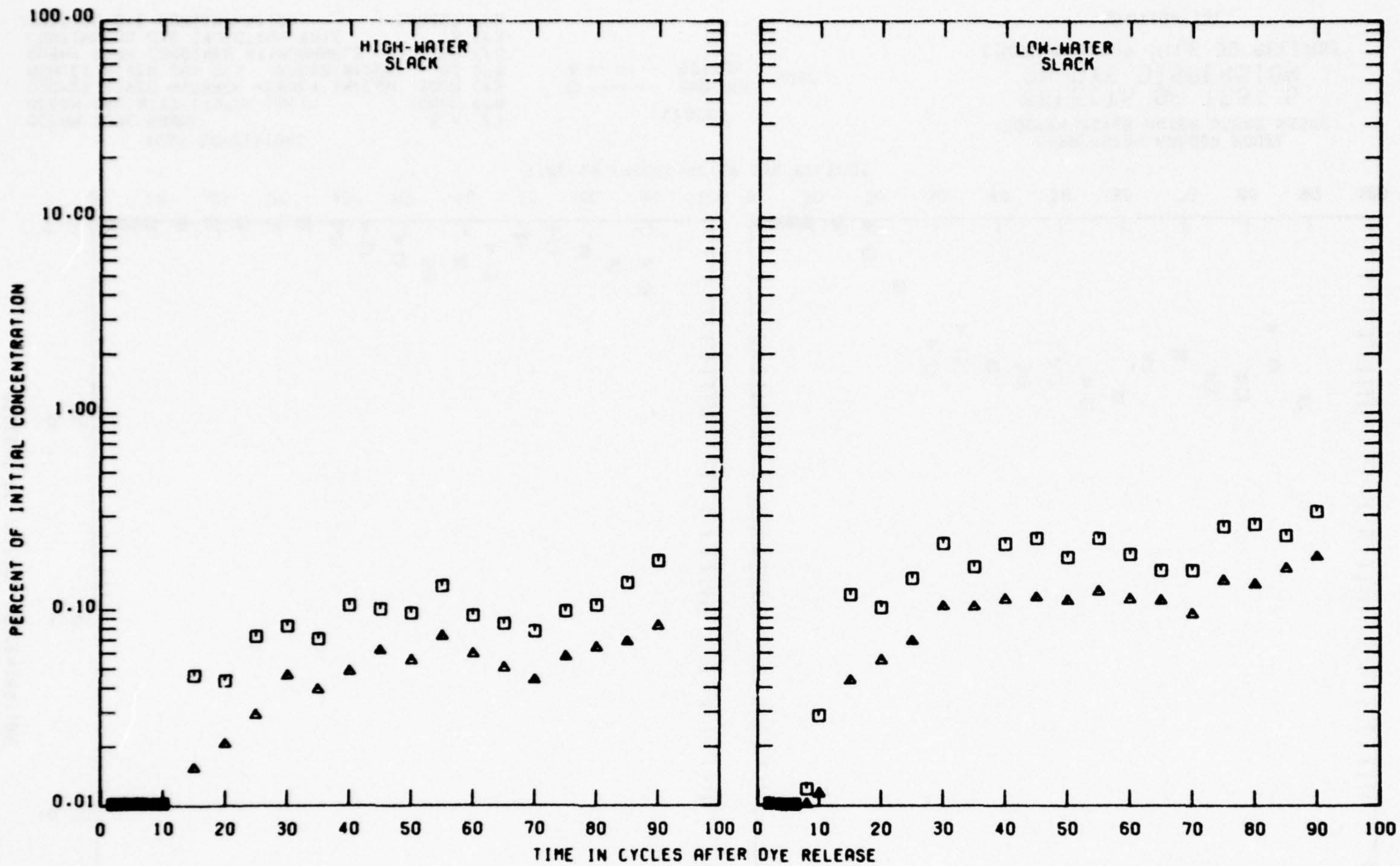
TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 5
ON DYE DISPERSION
COOPER RIVER MILE 30 RELEASE

STATION 10C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
CONTINUOUS DYE INJECTION RATE	15	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

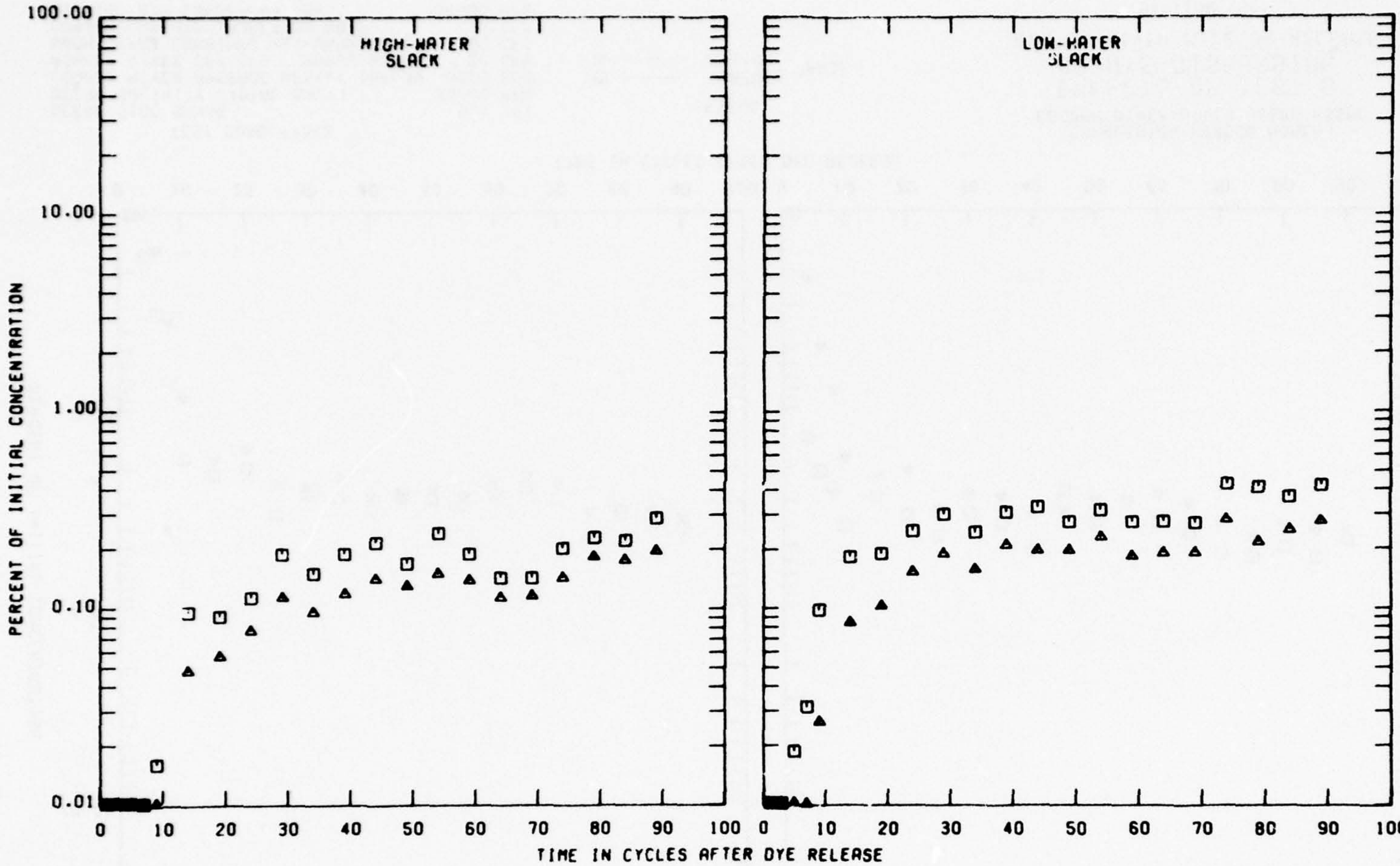
□ ——— SURFACE
▲ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 5
ON DYE DISPERSION

COOPER RIVER MILE 30 RELEASE

STATION 15C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

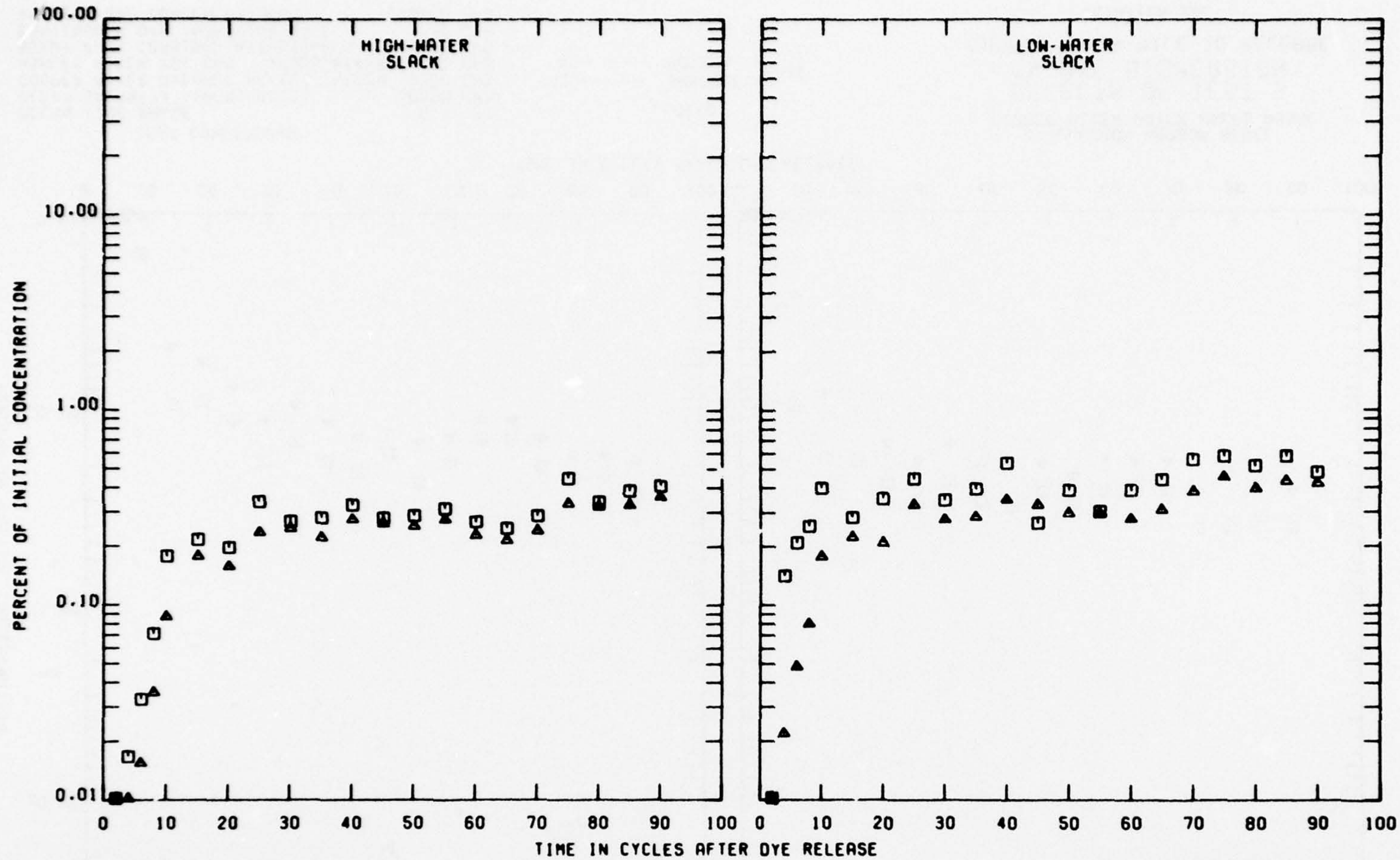
LEGEND

□ ——— SURFACE BASE
▲ – – – BOTTOM

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 5
ON DYE DISPERSION
COOPER RIVER MILE 30 RELEASE

STATION 20C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

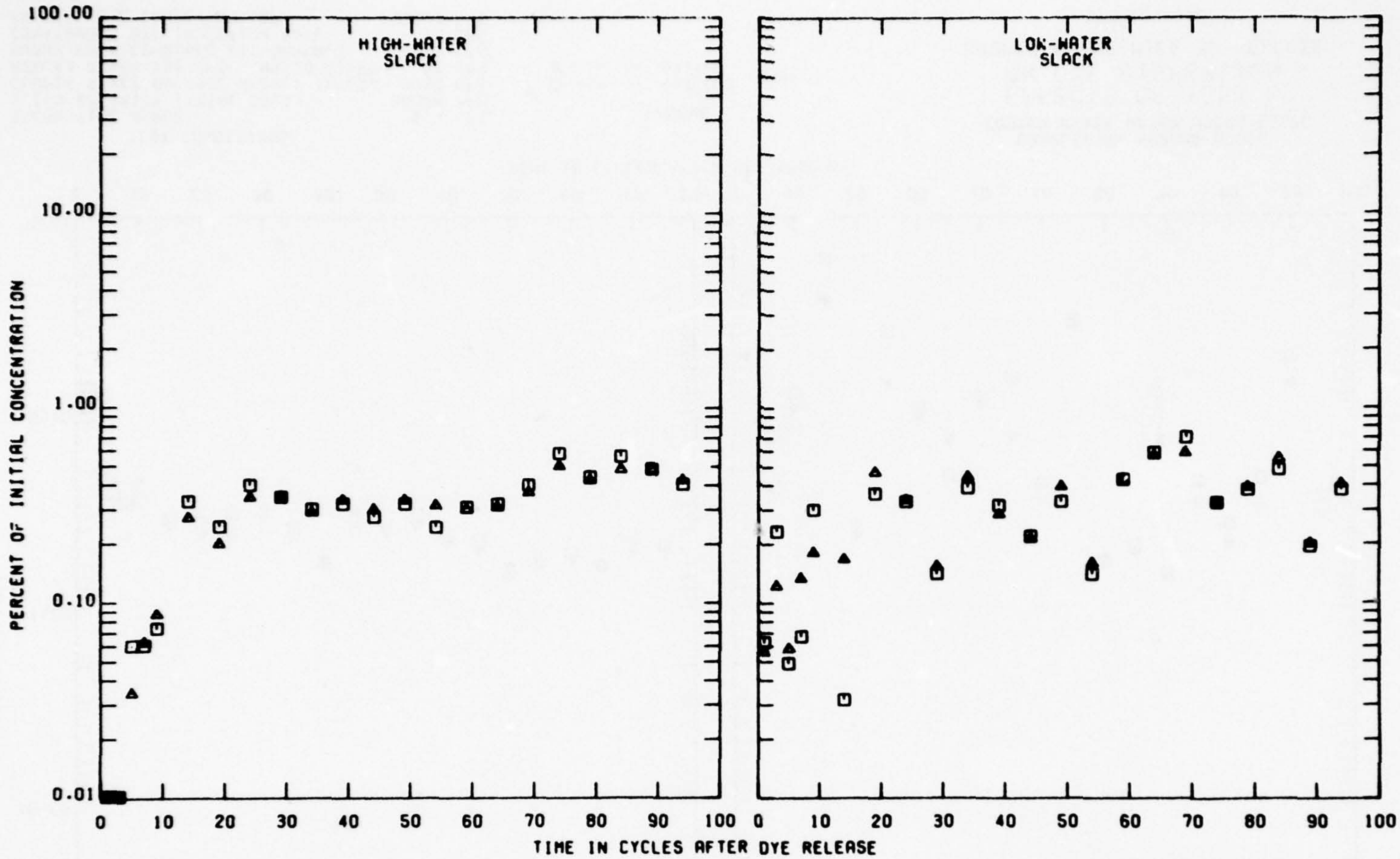
□ ——— SURFACE
▲ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 5
ON DYE DISPERSION

COOPER RIVER MILE 30 RELEASE

STATION 25C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COCPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
CONTINUOUS DYE INJECTION RATE	15	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

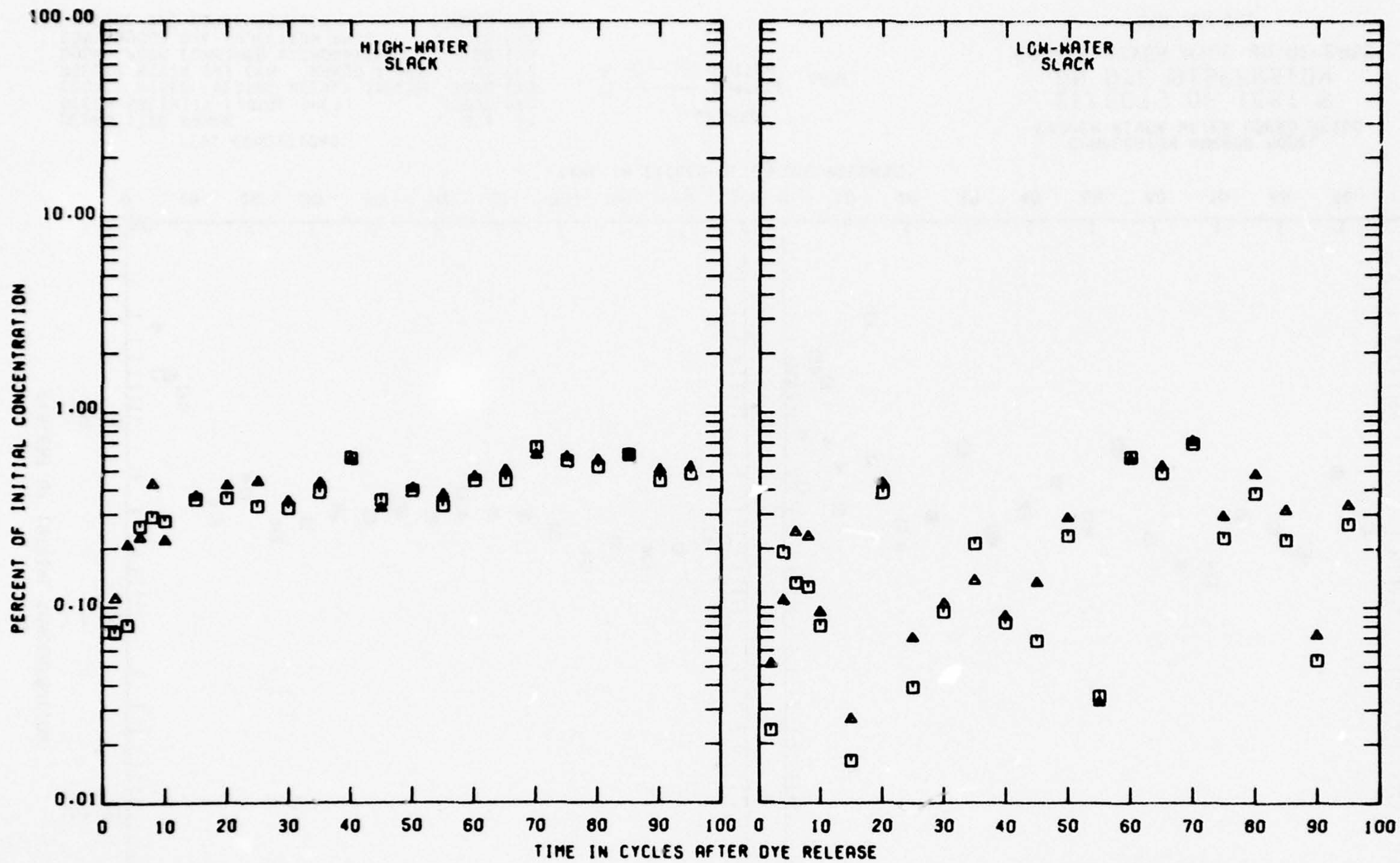
□ ——— SURFACE BASE
▲ — — — BOTTOM

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 5
ON DYE DISPERSION

COOPER RIVER MILE 30 RELEASE

STATION 29C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

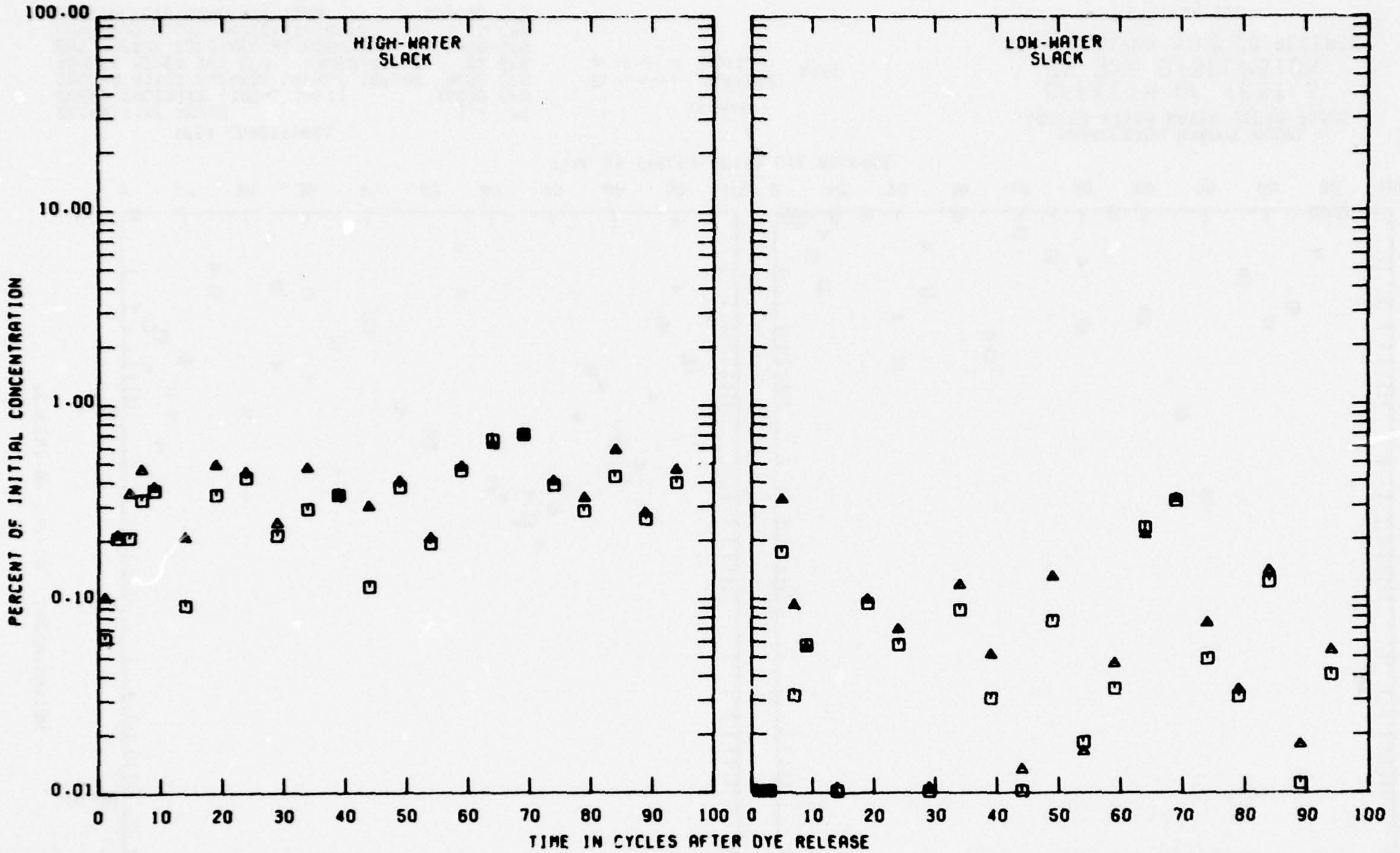
□ ——— SURFACE BASE
▲ – – – BOTTOM

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 5
ON DYE DISPERSION

COOPER RIVER MILE 30 RELEASE

STATION 31C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	3000C PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

□ ——— SURFACE BASE
▲ — — — BOTTOM

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 5 ON DYE DISPERSION

COOPER RIVER MILE 30 RELEASE

STATION 34C

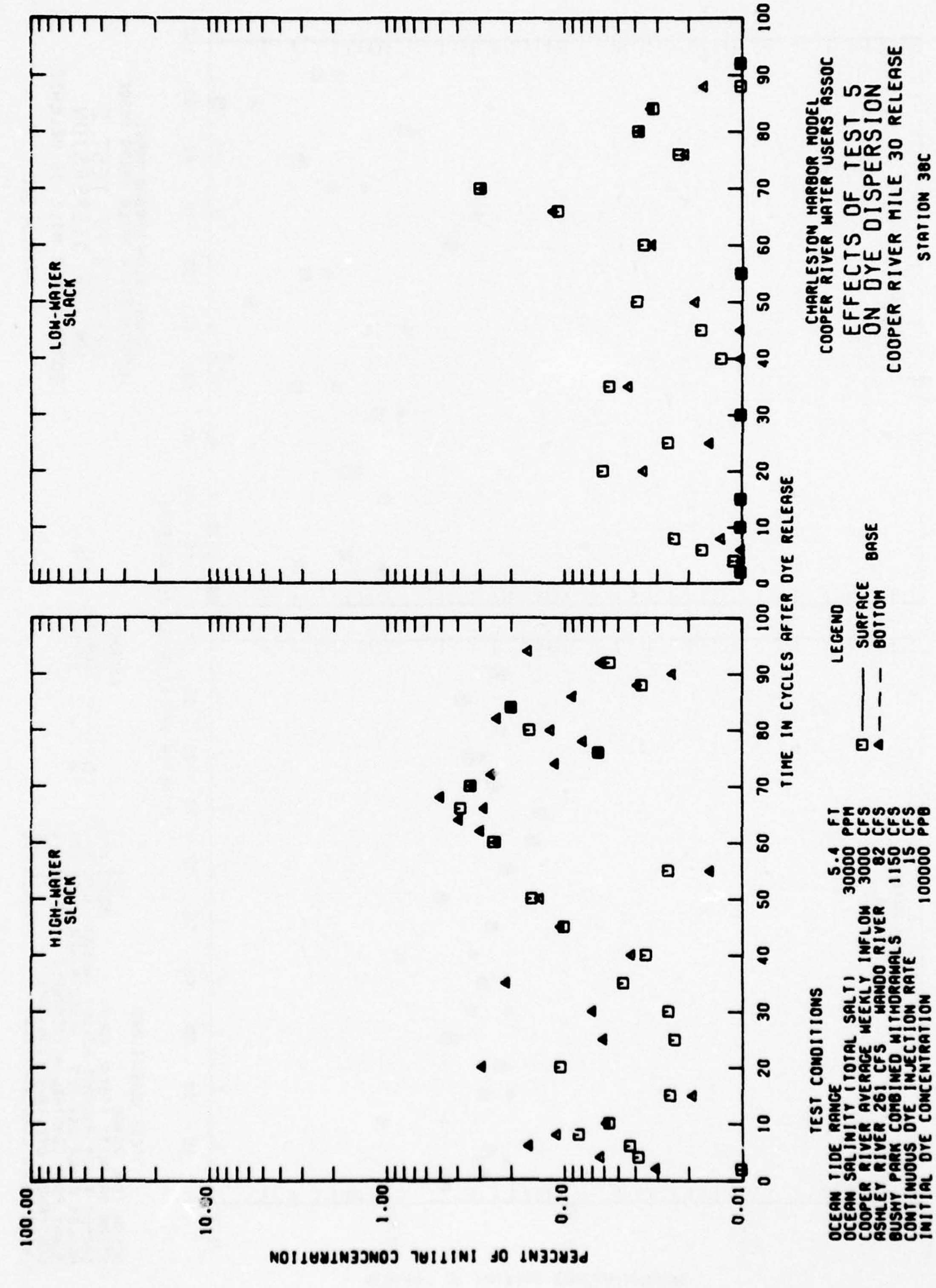
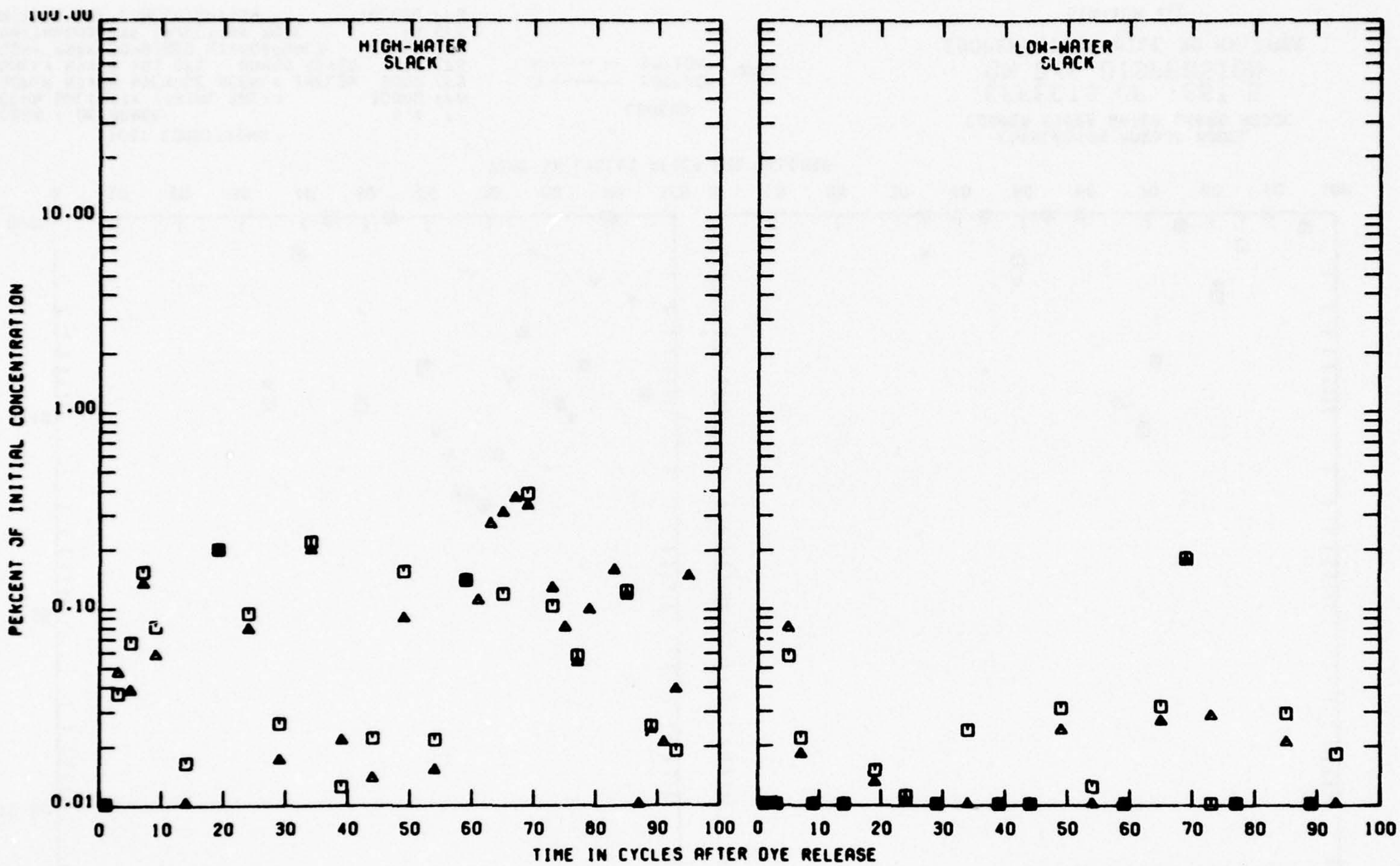

HIGH-WATER SLACK
LOW-WATER SLACK
PERCENT OF INITIAL CONCENTRATION
100.00
10.00
1.00
0.10
0.01
0 10 20 30 40 50 60 70 80 90 100
TIME IN CYCLES AFTER DYE RELEASE
TEST CONDITIONS
OCEAN TIDE RANGE 5.4 FT
OCEAN SALINITY (TOTAL SALT) 30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW 3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER 82 CFS
BUSHY PARK COMBINED WITHDRAWALS 1150 CFS
CONTINUOUS DYE INJECTION RATE 15 CFS
INITIAL DYE CONCENTRATION 100000 PPB
LEGEND
SURFACE
BOTTOM
BASE
CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC
EFFECTS OF TEST 5
ON DYE DISPERSION
COOPER RIVER MILE 30 RELEASE
STATION 38C

PLATE 82



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

□ ——— SURFACE
▲ — — — BOTTOM

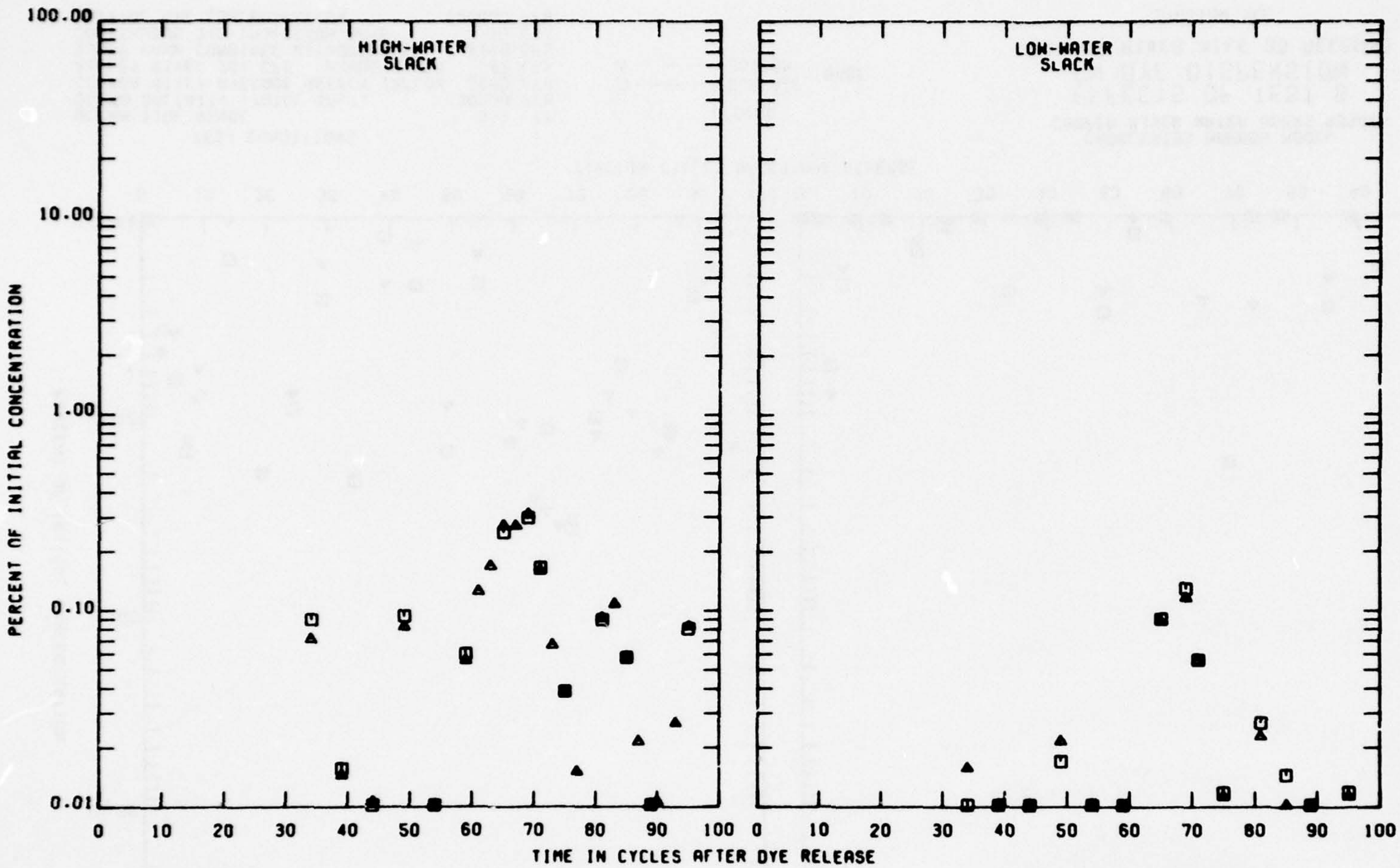
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 5
ON DYE DISPERSION

COOPER RIVER MILE 30 RELEASE

STATION TEE



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

□ ——— SURFACE
▲ — — — BOTTOM
BASE

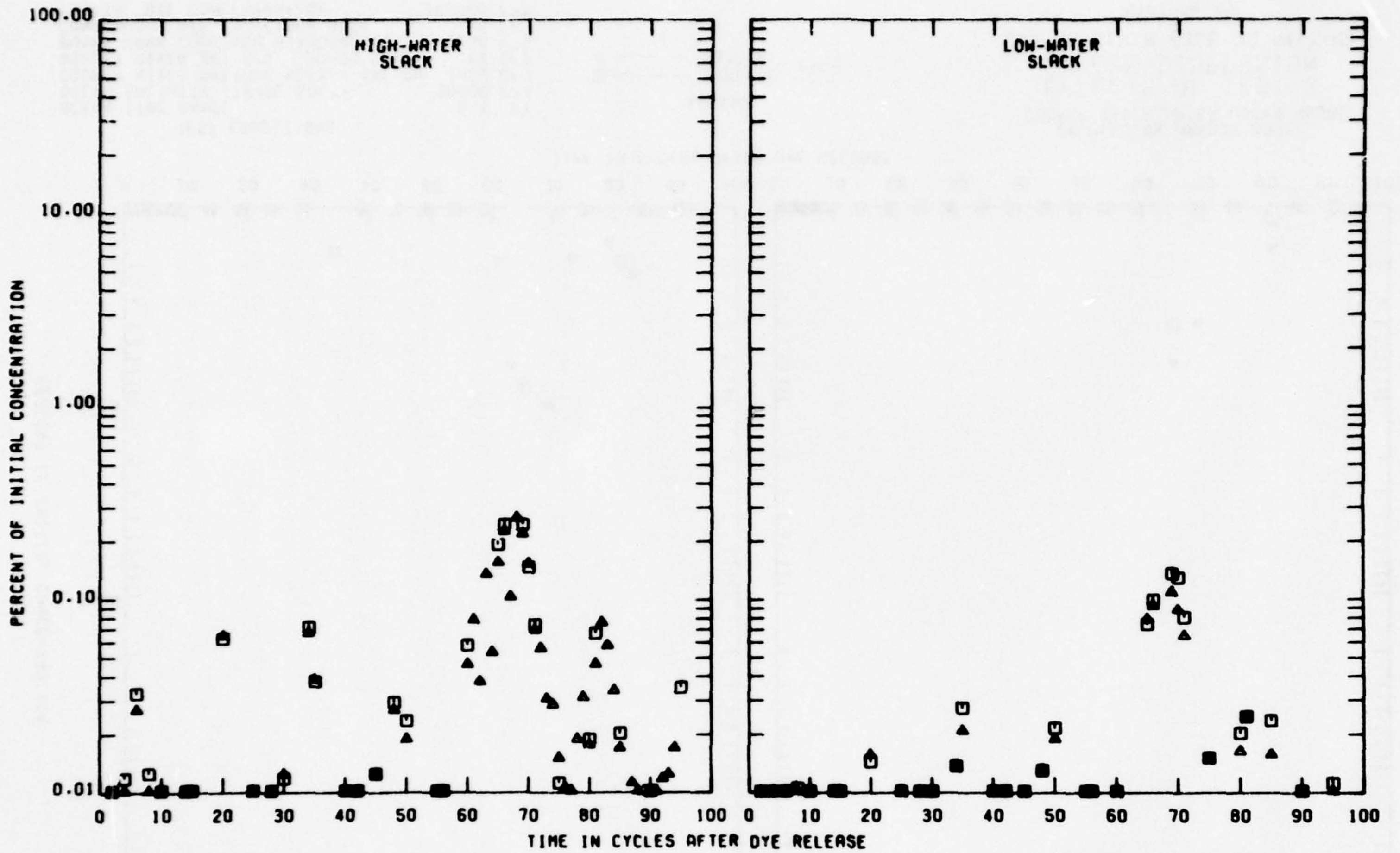
CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 5
ON DYE DISPERSION

COOPER RIVER MILE 30 RELEASE

STATION 41C

PLATE 84



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

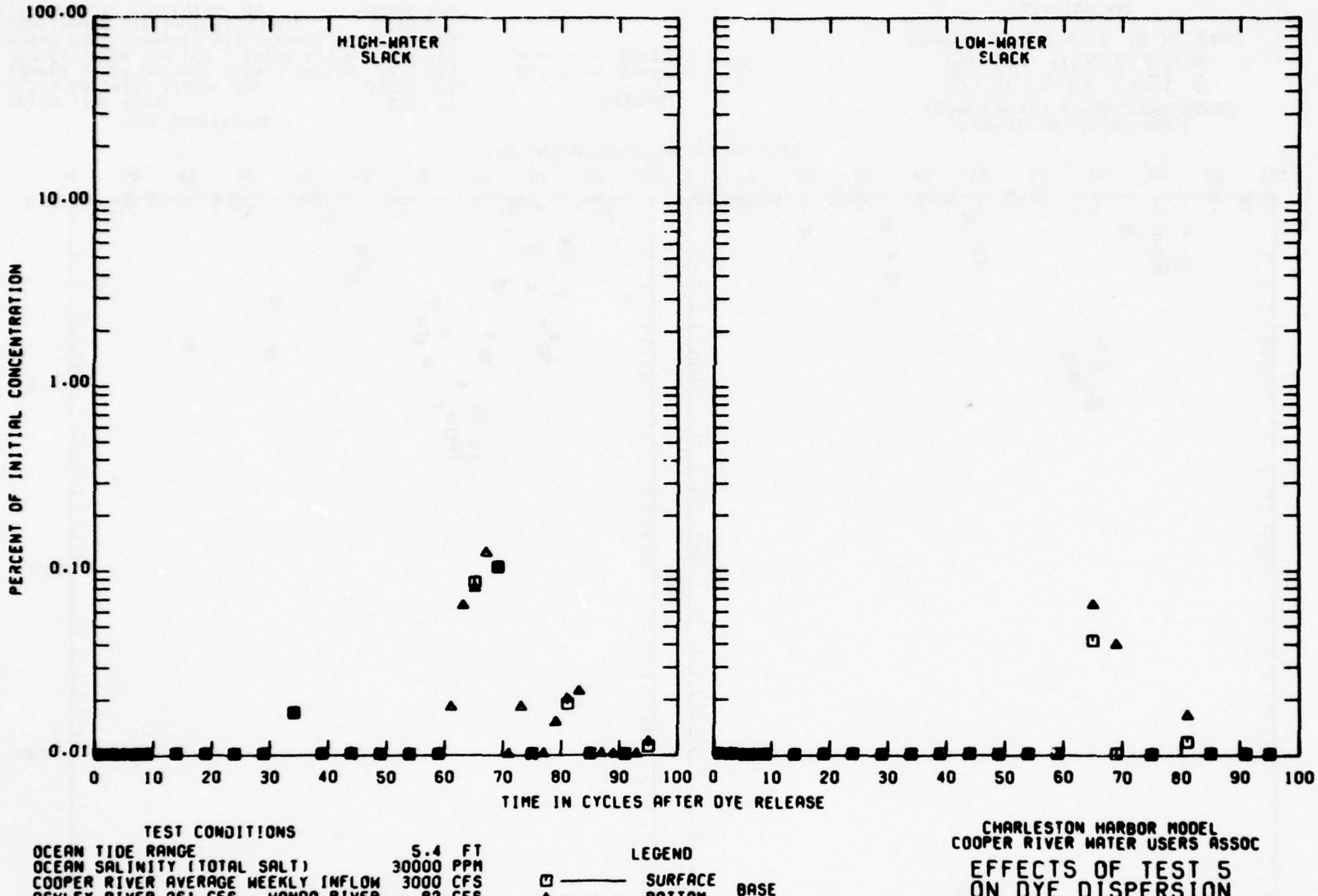
□ ——— SURFACE
▲ – – – BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 5
ON DYE DISPERSION

COOPER RIVER MILE 30 RELEASE

STATION 43C



TEST CONDITIONS

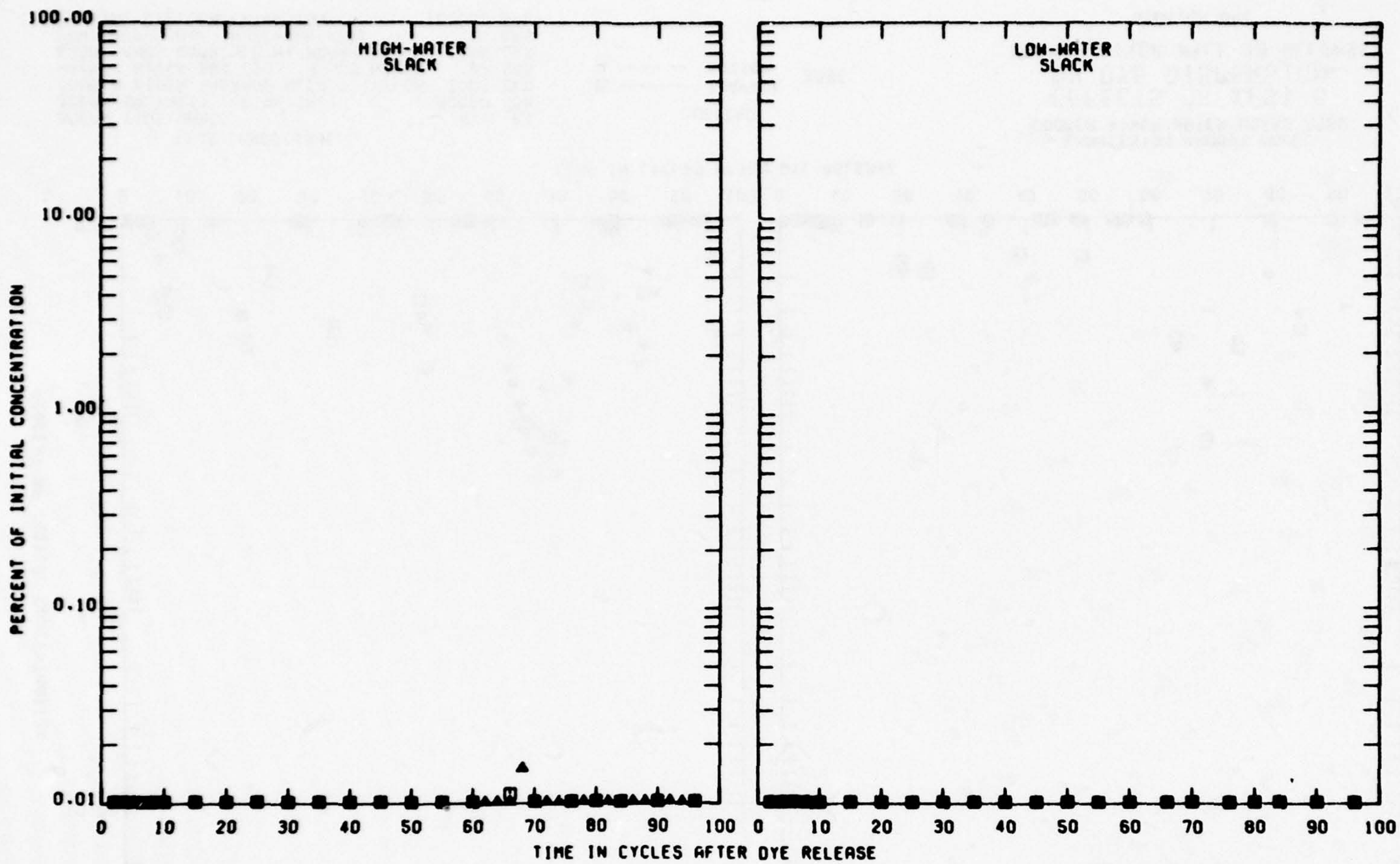
OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 5
ON DYE DISPERSION

COOPER RIVER MILE 30 RELEASE

STATION 45C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
CONTINUOUS DYE INJECTION RATE	15	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

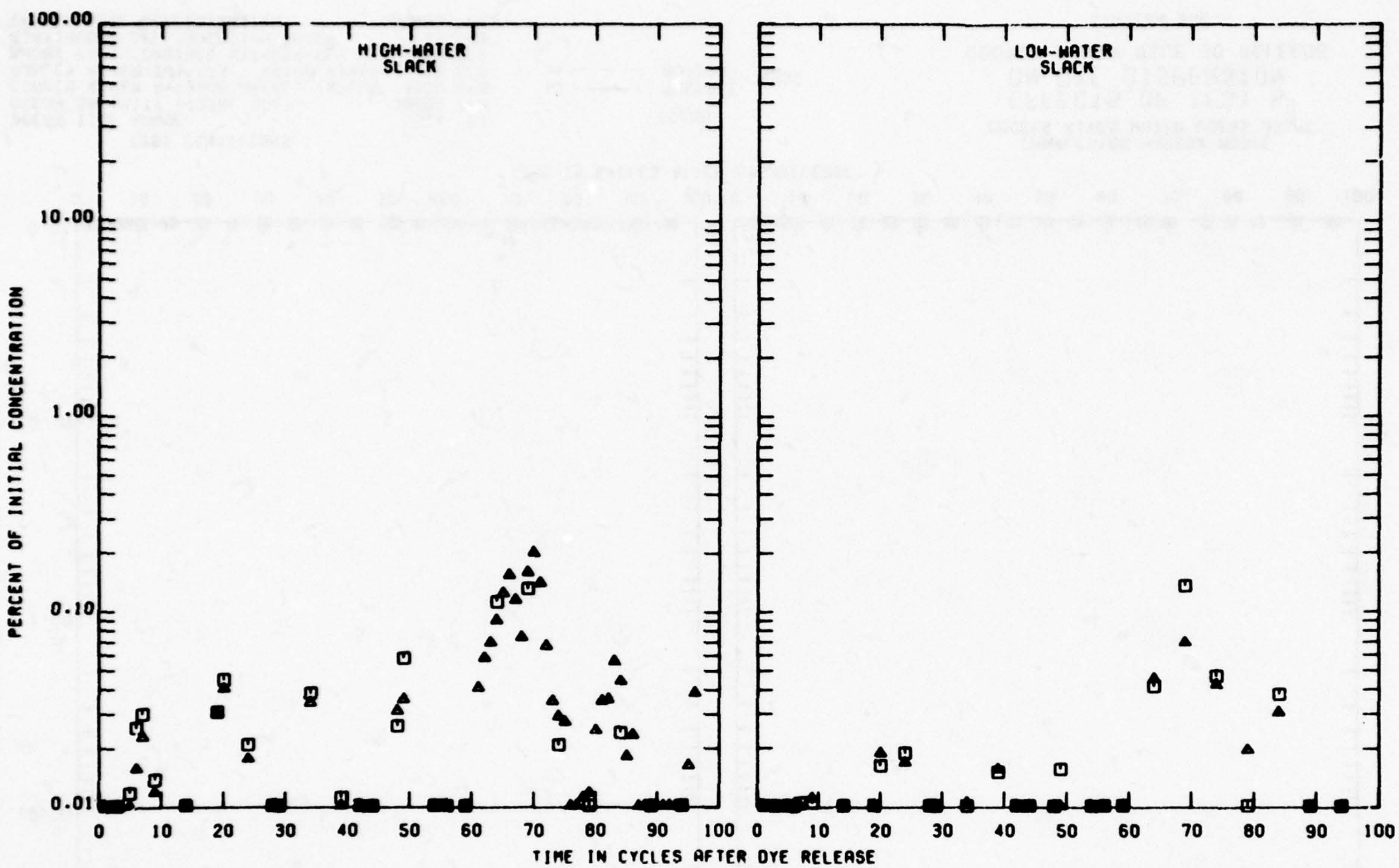
□ ——— SURFACE
▲ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 5
ON DYE DISPERSION

COOPER RIVER MILE 30 RELEASE

STATION 50C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

□ ——— SURFACE BASE
▲ — — — BOTTOM

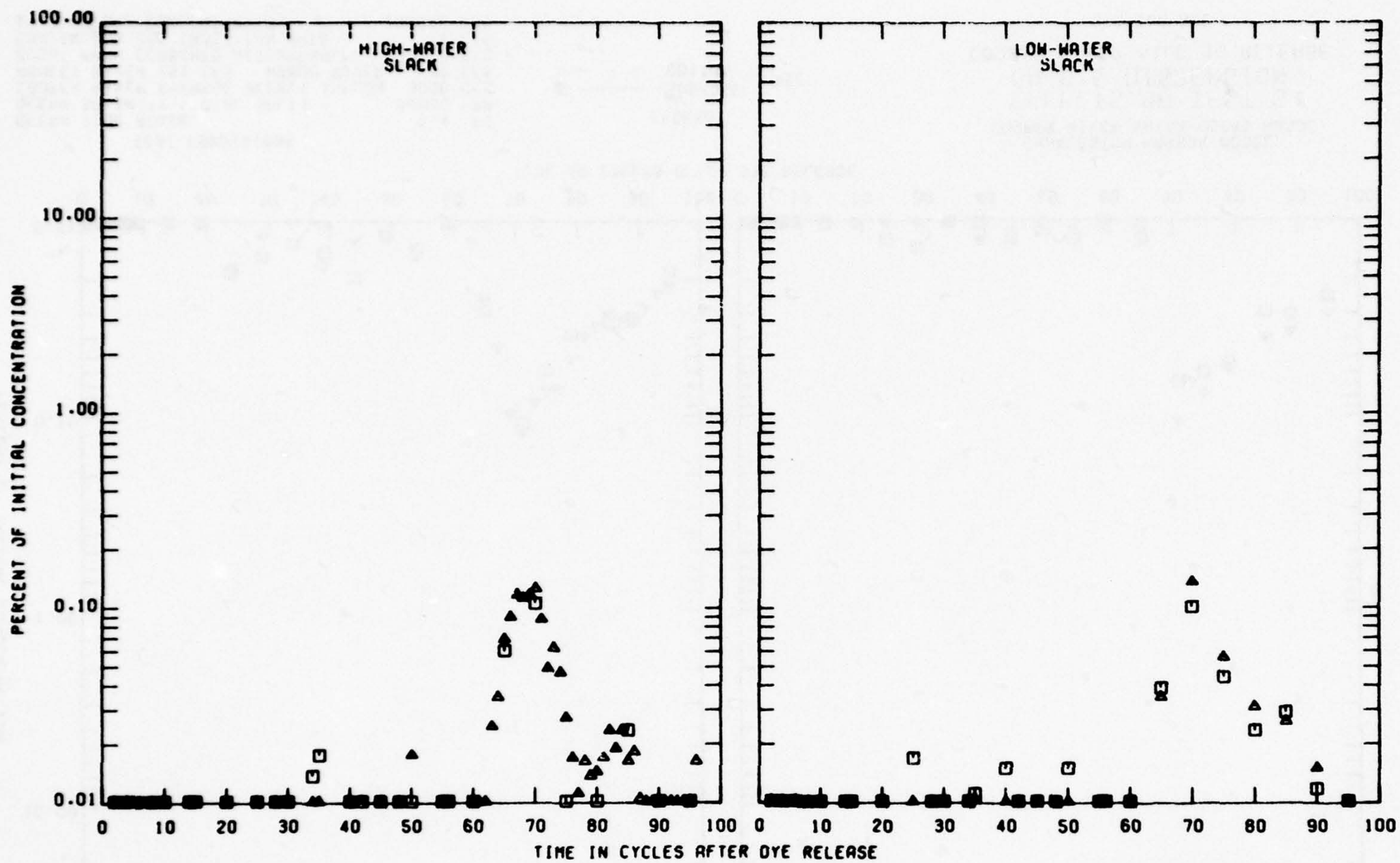
CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 5
ON DYE DISPERSION

COOPER RIVER MILE 30 RELEASE

STATION BRC

PLATE 88



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

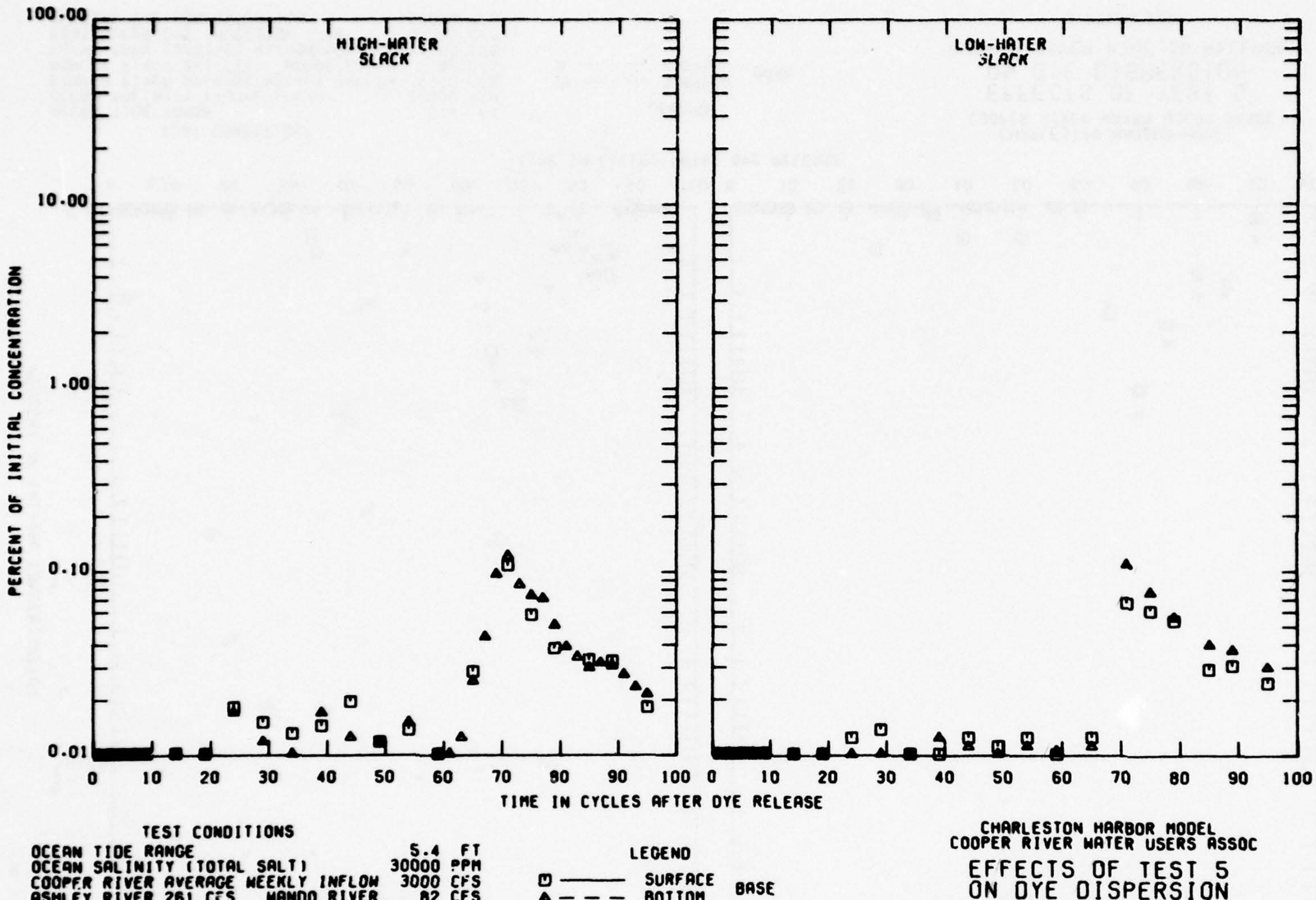
□ ——— SURFACE BASE
△ — — — BOTTOM

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 5
ON DYE DISPERSION

COOPER RIVER MILE 30 RELEASE

STATION BR1



TEST CONDITIONS

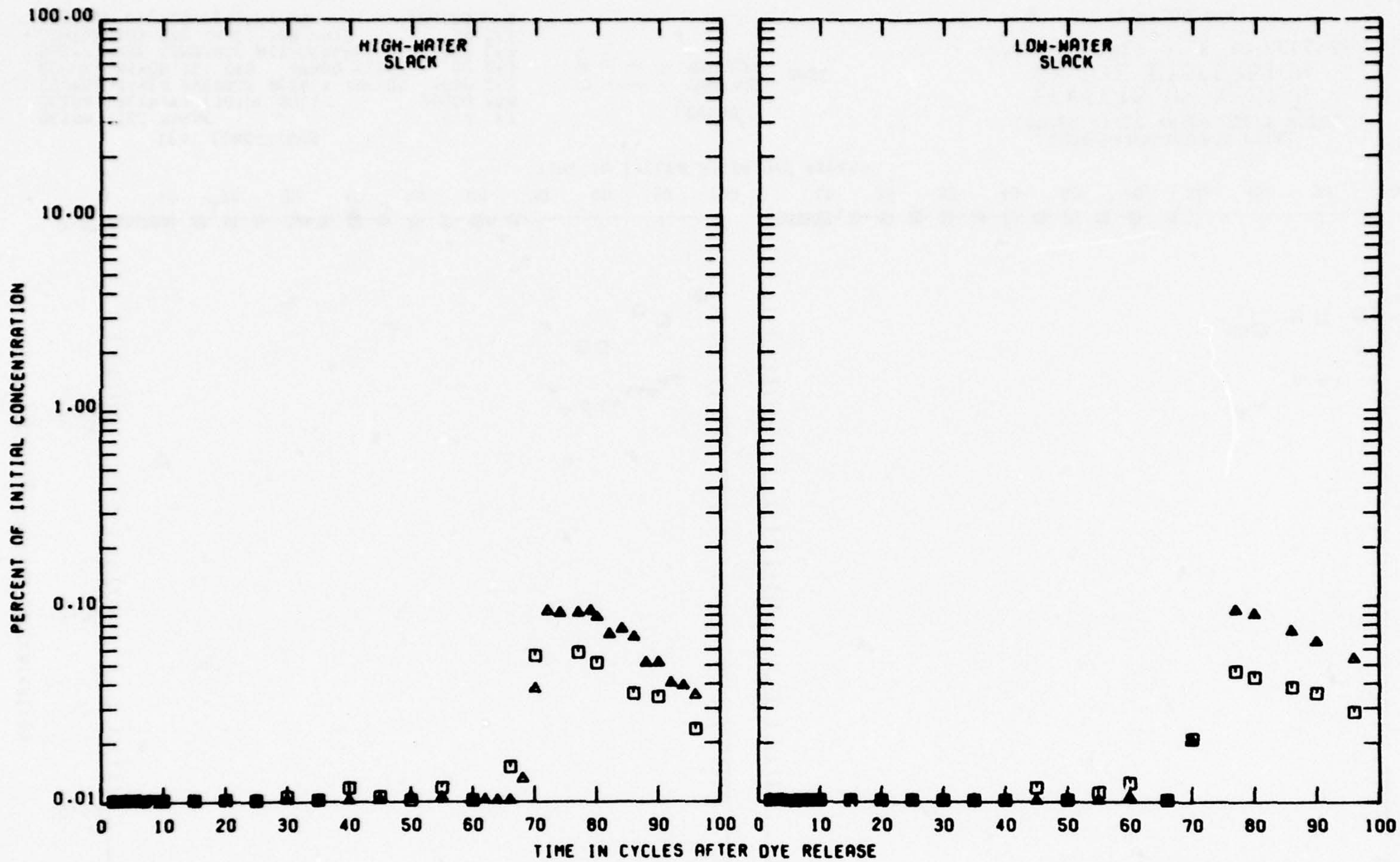
OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 5
ON DYE DISPERSION

COOPER RIVER MILE 30 RELEASE

STATION BR2



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
CONTINUOUS DYE INJECTION RATE	15	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

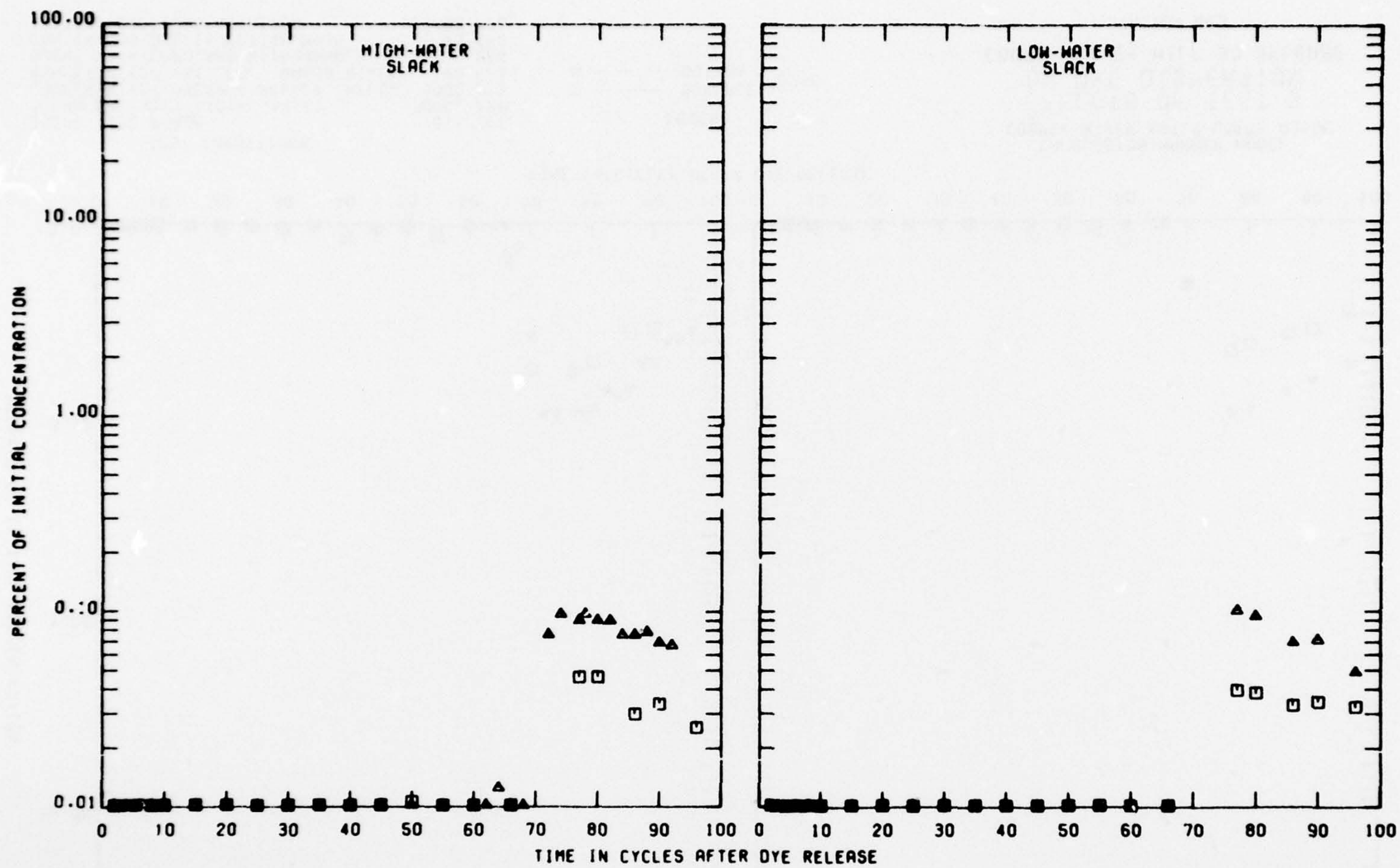
□ ——— SURFACE BASE
▲ — — — BOTTOM

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 5
ON DYE DISPERSION

COOPER RIVER MILE 30 RELEASE

STATION BR3



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3000 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

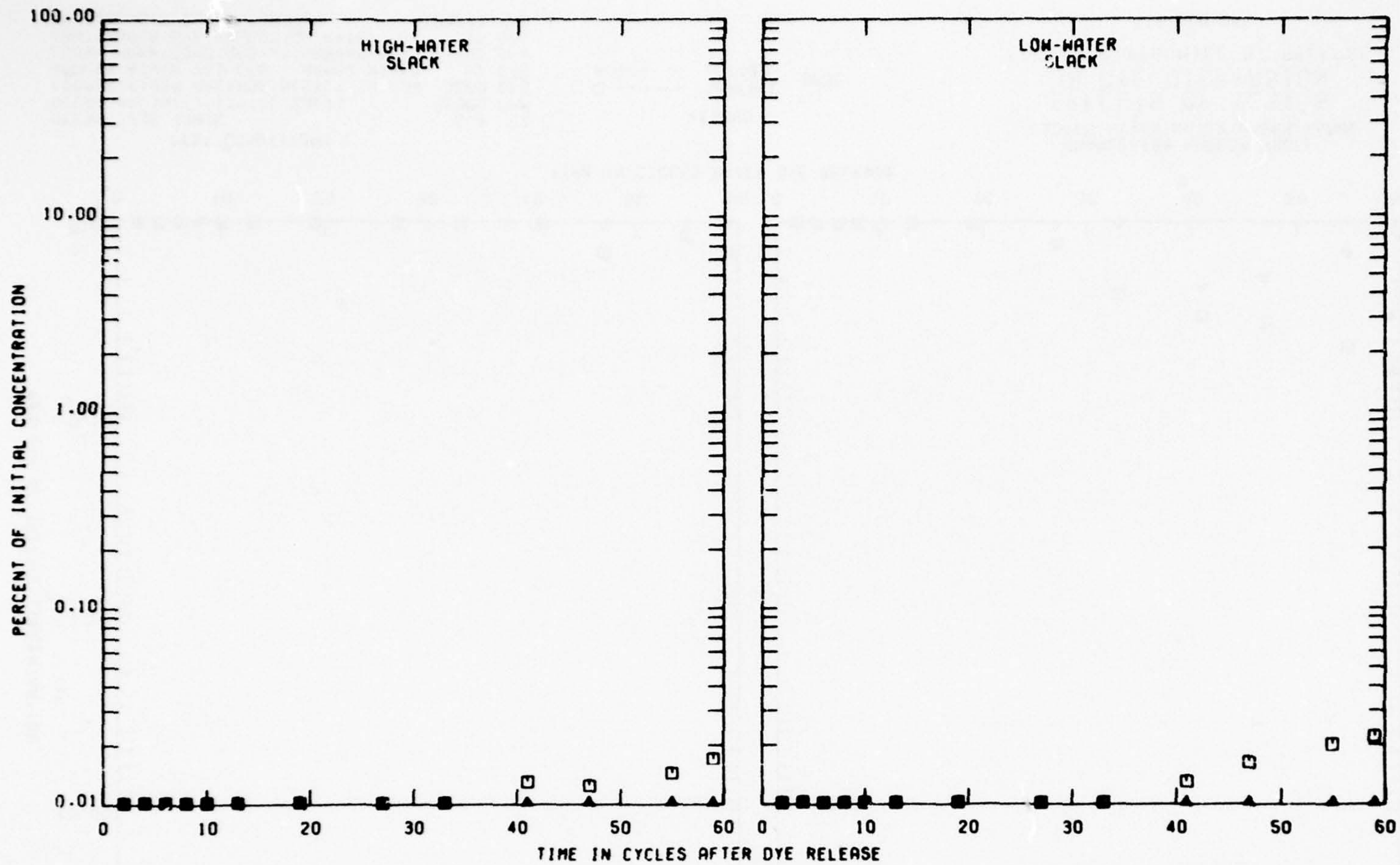
□ ——— SURFACE
▲ – – – BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 5
ON DYE DISPERSION

COOPER RIVER MILE 30 RELEASE

STATION BR4



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3500 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

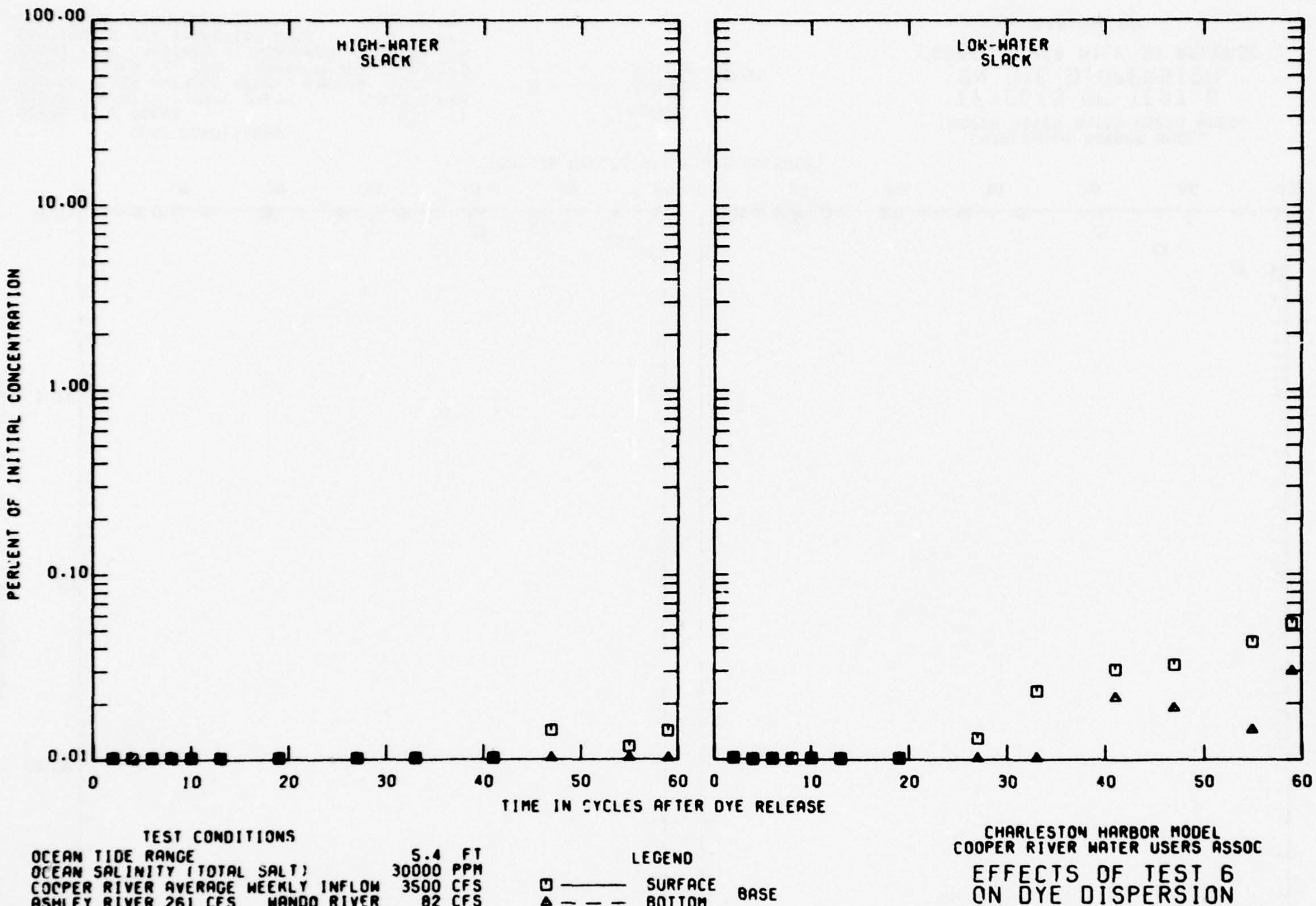
□ ——— SURFACE
▲ – – – BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 6
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION OOC



TEST CONDITIONS

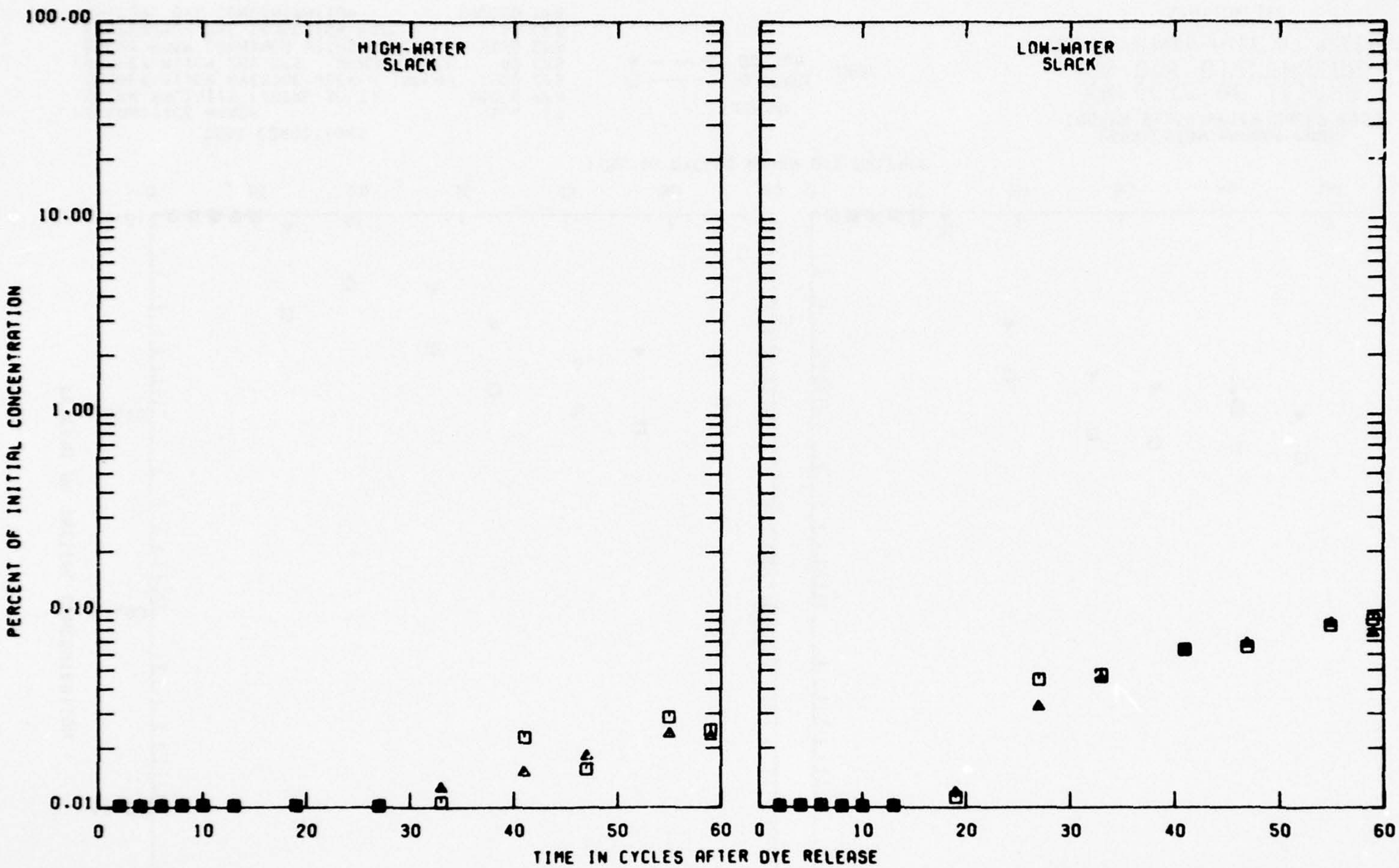
OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3500	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
CONTINUOUS DYE INJECTION RATE	15	CFS
INITIAL DYE CONCENTRATION	100000	PPB

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 6
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION OSC



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3500 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

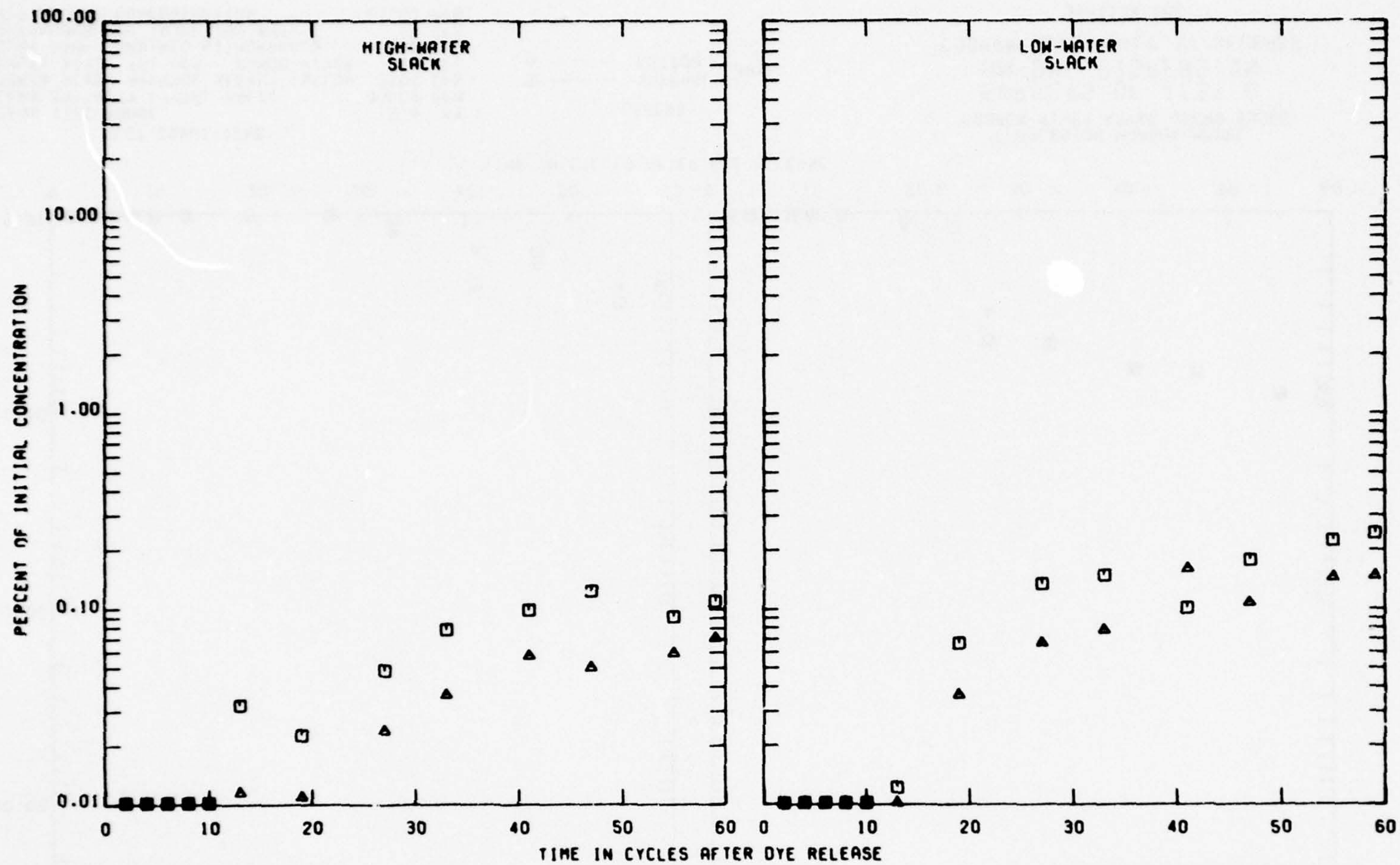
□ ——— SURFACE
▲ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 6
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION 10C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3500	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
CONTINUOUS DYE INJECTION RATE	15	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

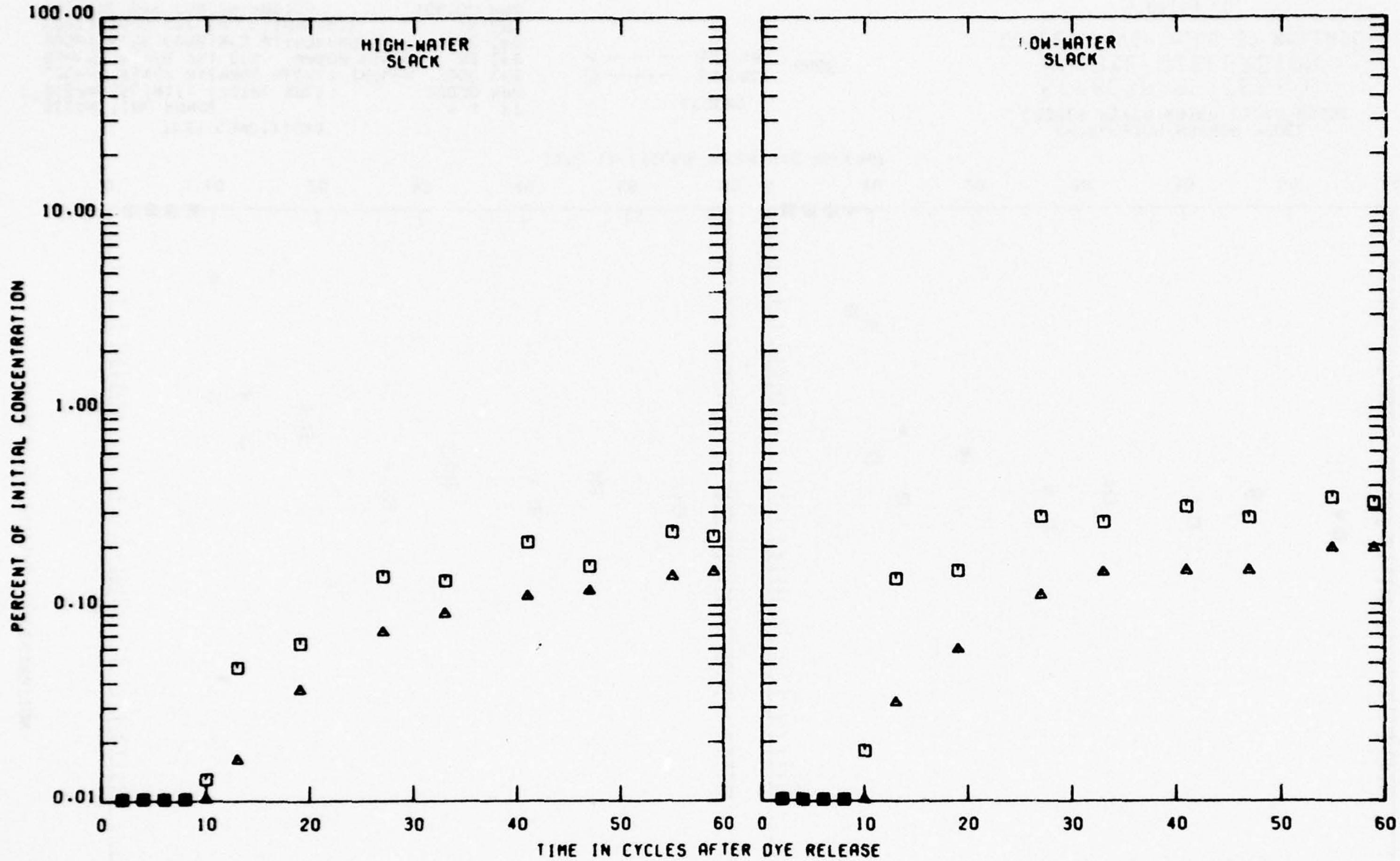
□ ——— SURFACE
▲ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 6
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION 15C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3500 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

□ ——— SURFACE BASE
▲ – – – BOTTOM

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 6
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION 20C

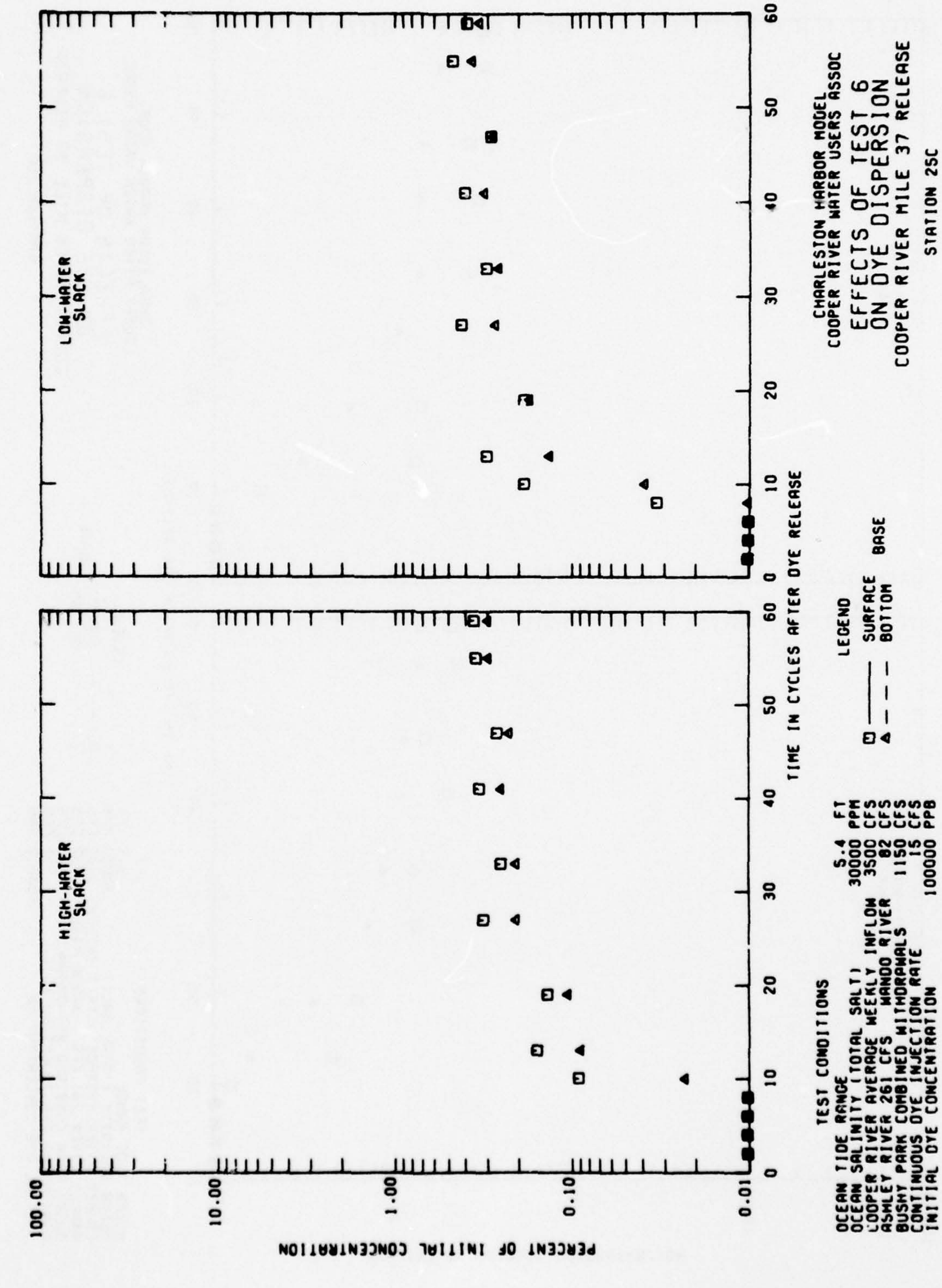
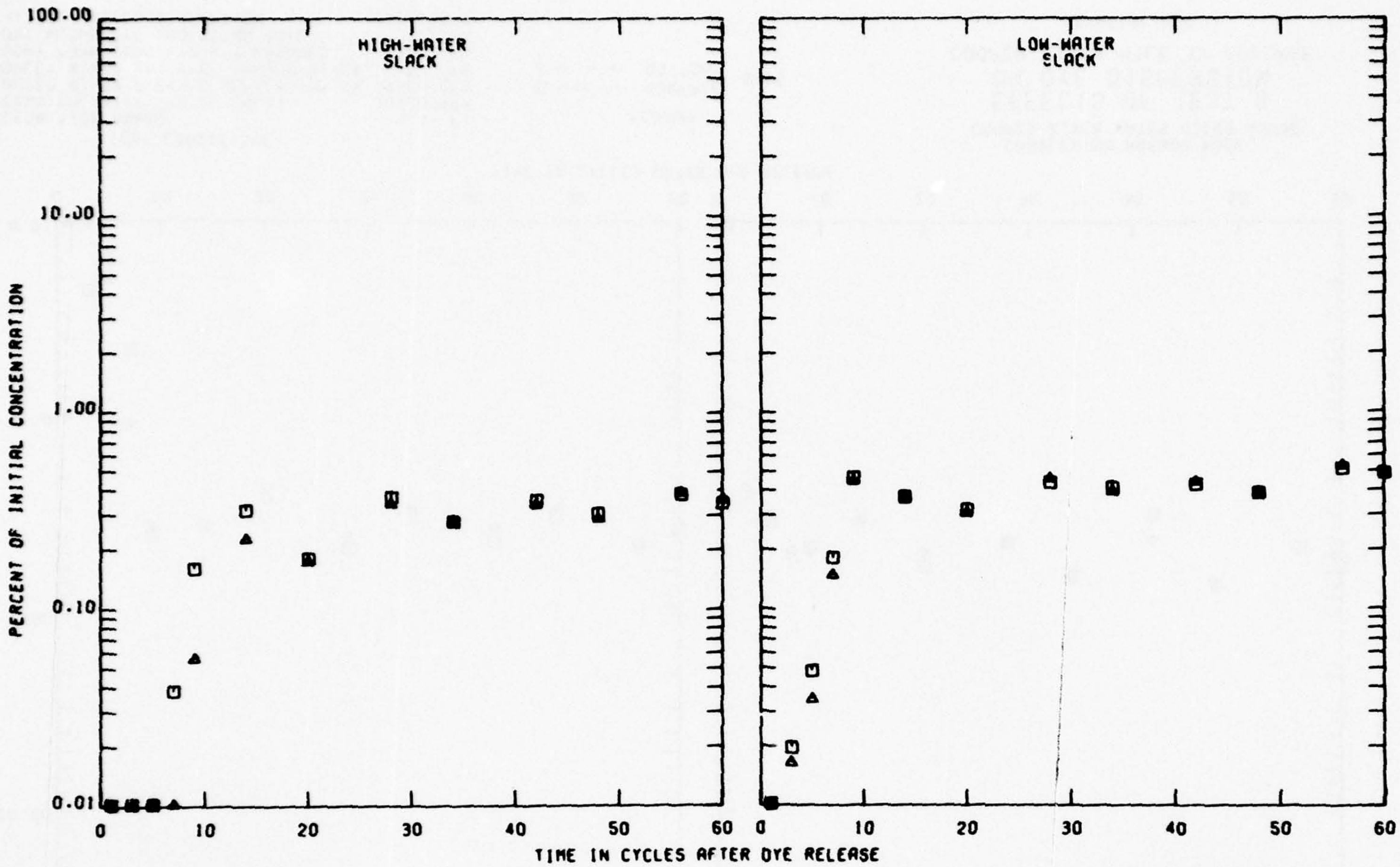

HIGH-WATER SLACK
LOW-WATER SLACK
PERCENT OF INITIAL CONCENTRATION
100.00
10.00
1.00
0.10
0.01
0
10
20
30
40
50
60
TIME IN CYCLES AFTER DYE RELEASE
TEST CONDITIONS
OCEAN TIDE RANGE 5.4 FT
OCEAN SALINITY (TOTAL SALT) 30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW 3500 CFS
ASHLEY RIVER 261 CFS WANDO RIVER 82 CFS
BUSHY PARK COMBINED WITHDRAWALS 1150 CFS
CONTINUOUS DYE INJECTION RATE 15 CFS
INITIAL DYE CONCENTRATION 100000 PPB
LEGEND
SURFACE
BOTTOM
BASE
CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC
EFFECTS OF TEST 6
ON DYE DISPERSION
COOPER RIVER MILE 37 RELEASE
STATION 25C

PLATE 98



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3500	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
CONTINUOUS DYE INJECTION RATE	15	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

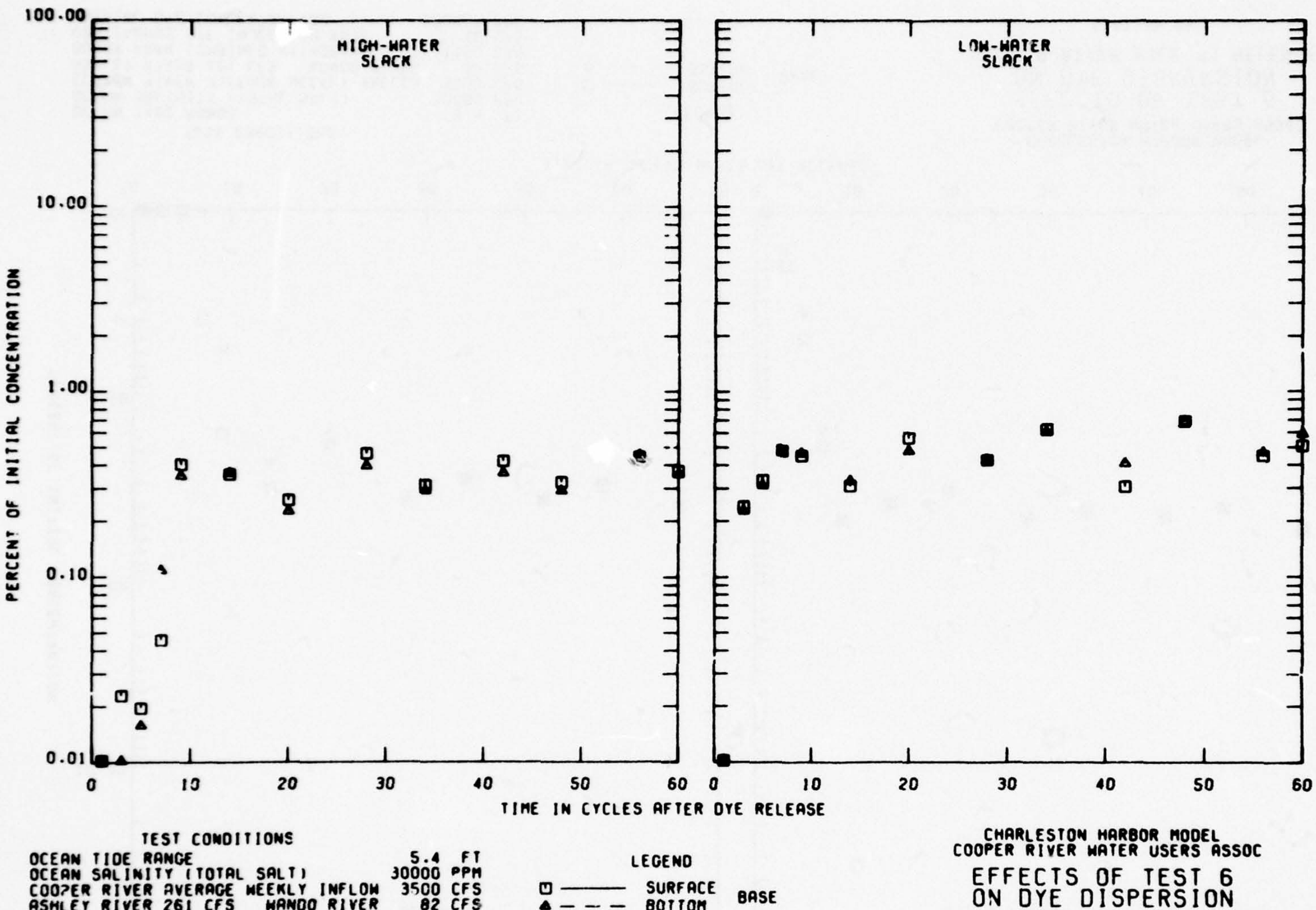
□ ——— SURFACE BASE
▲ — — — BOTTOM

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 6
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION 29C



TEST CONDITIONS

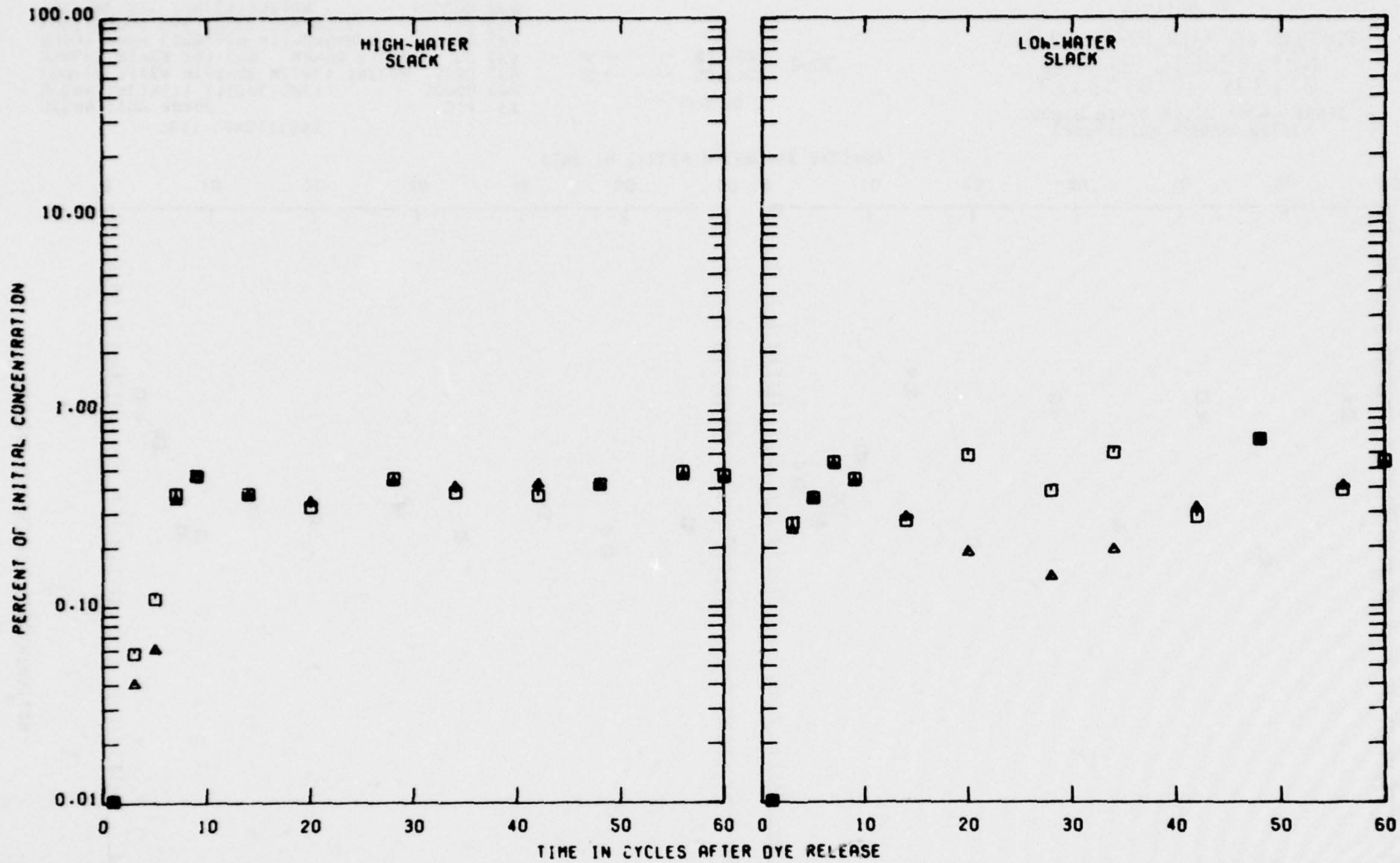
OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3500 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 6
ON DYE DISPERSION
COOPER RIVER MILE 37 RELEASE

STATION 33C

PLATE 100



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3500 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

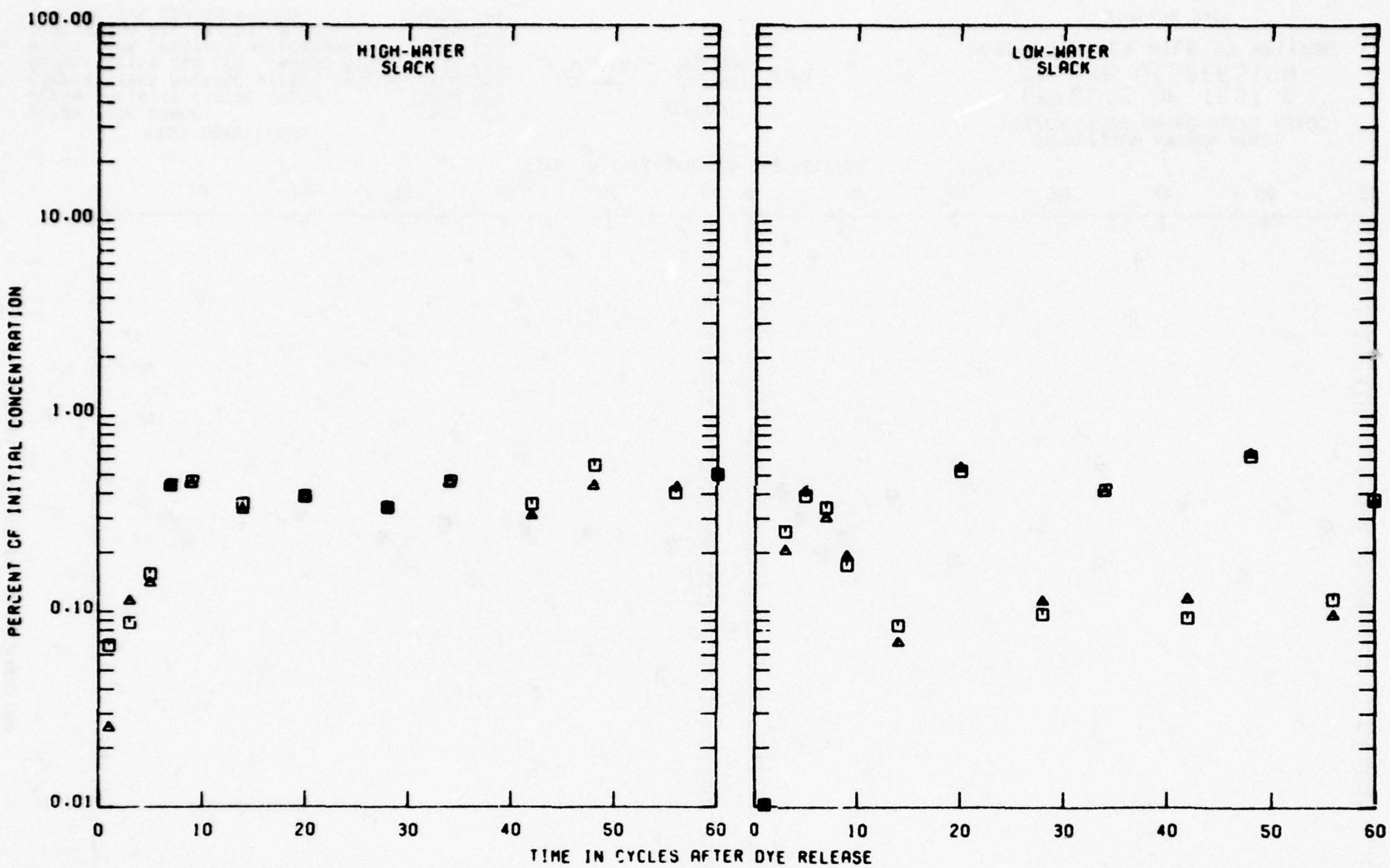
□ ——— SURFACE BASE
△ — — — BOTTOM

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 6
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION 34C



TEST CONDITIONS		
OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3500	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
CONTINUOUS DYE INJECTION RATE	15	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

□ ——— SURFACE
▲ — — — BOTTOM
BASE

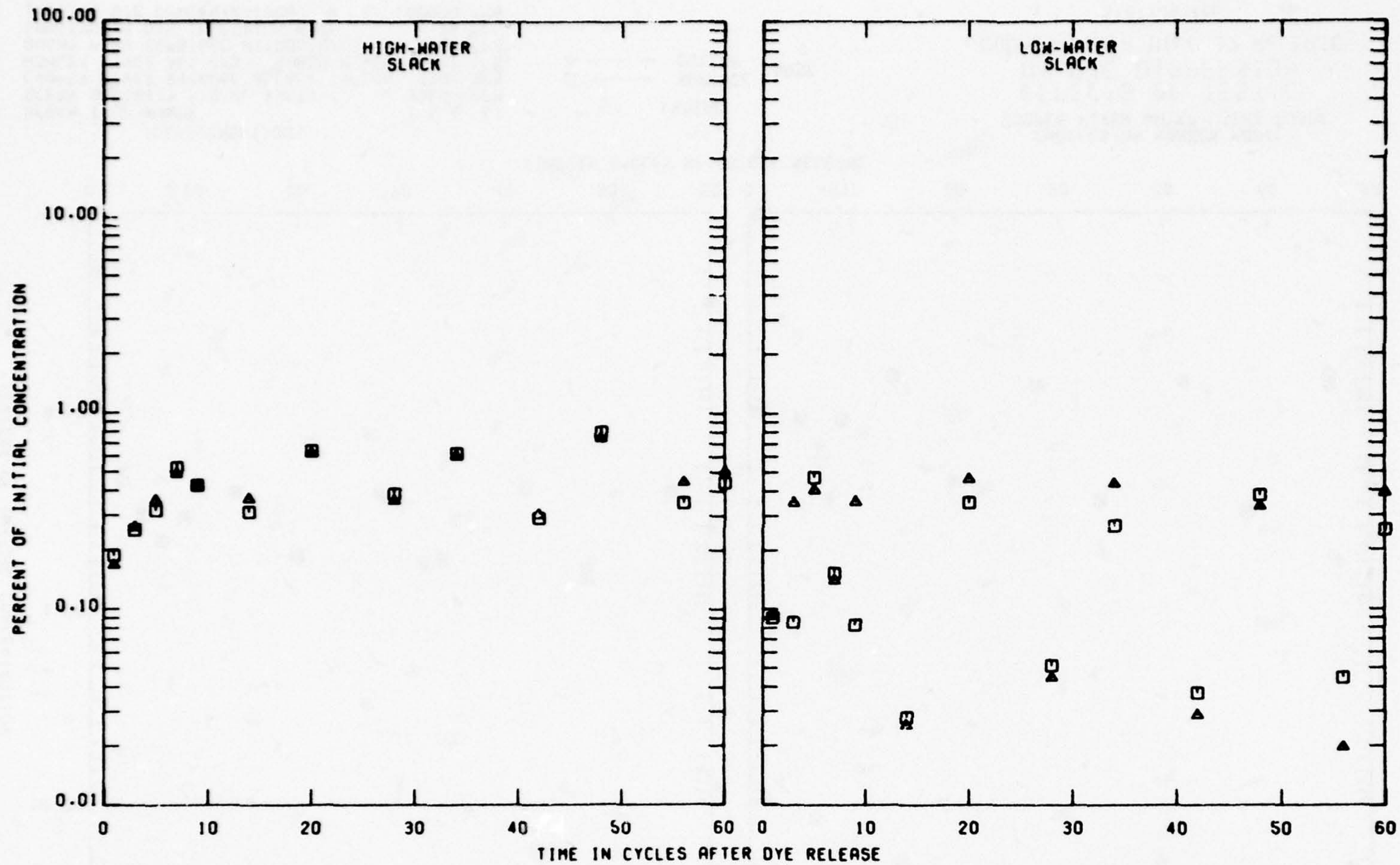
CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 6
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION 36C

PLATE 102



TEST CONDITIONS	
OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3500 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

□ ——— SURFACE
△ – – – BOTTOM
BASE

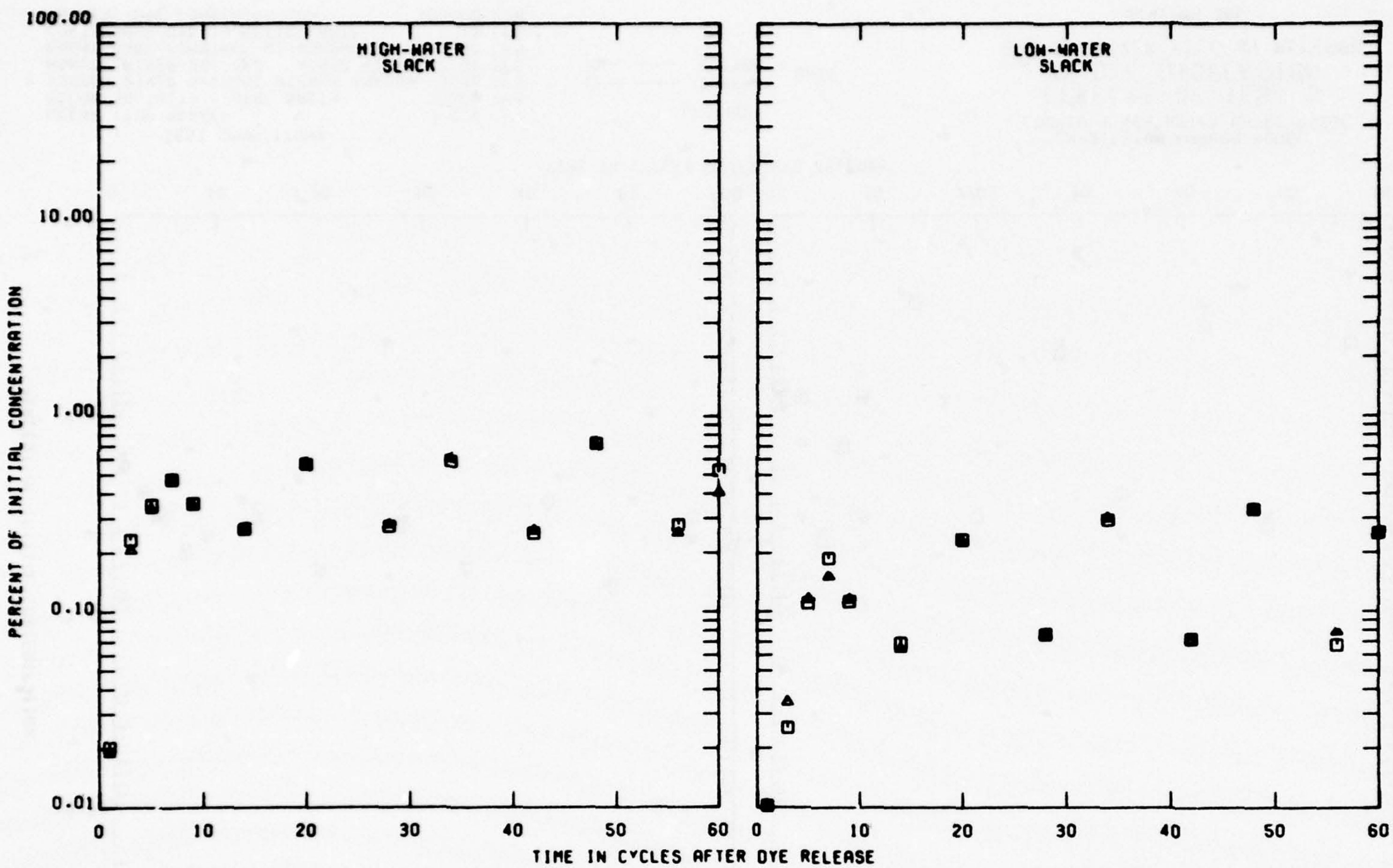
CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 6
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION 38C

PLATE 104



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3500	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
CONTINUOUS DYE INJECTION RATE	15	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

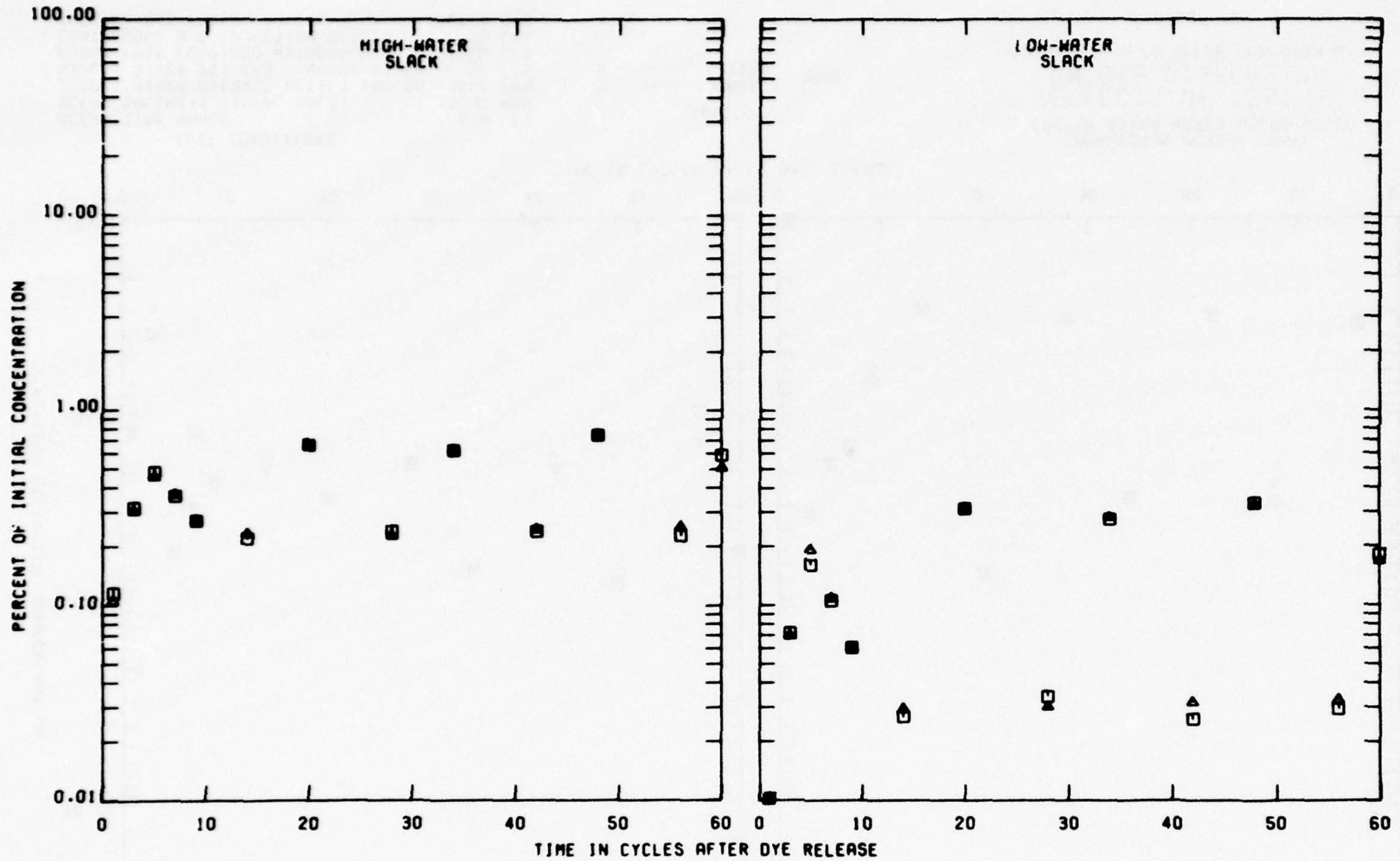
□ ——— SURFACE
▲ – – – BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 6
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION TEE



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3500 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

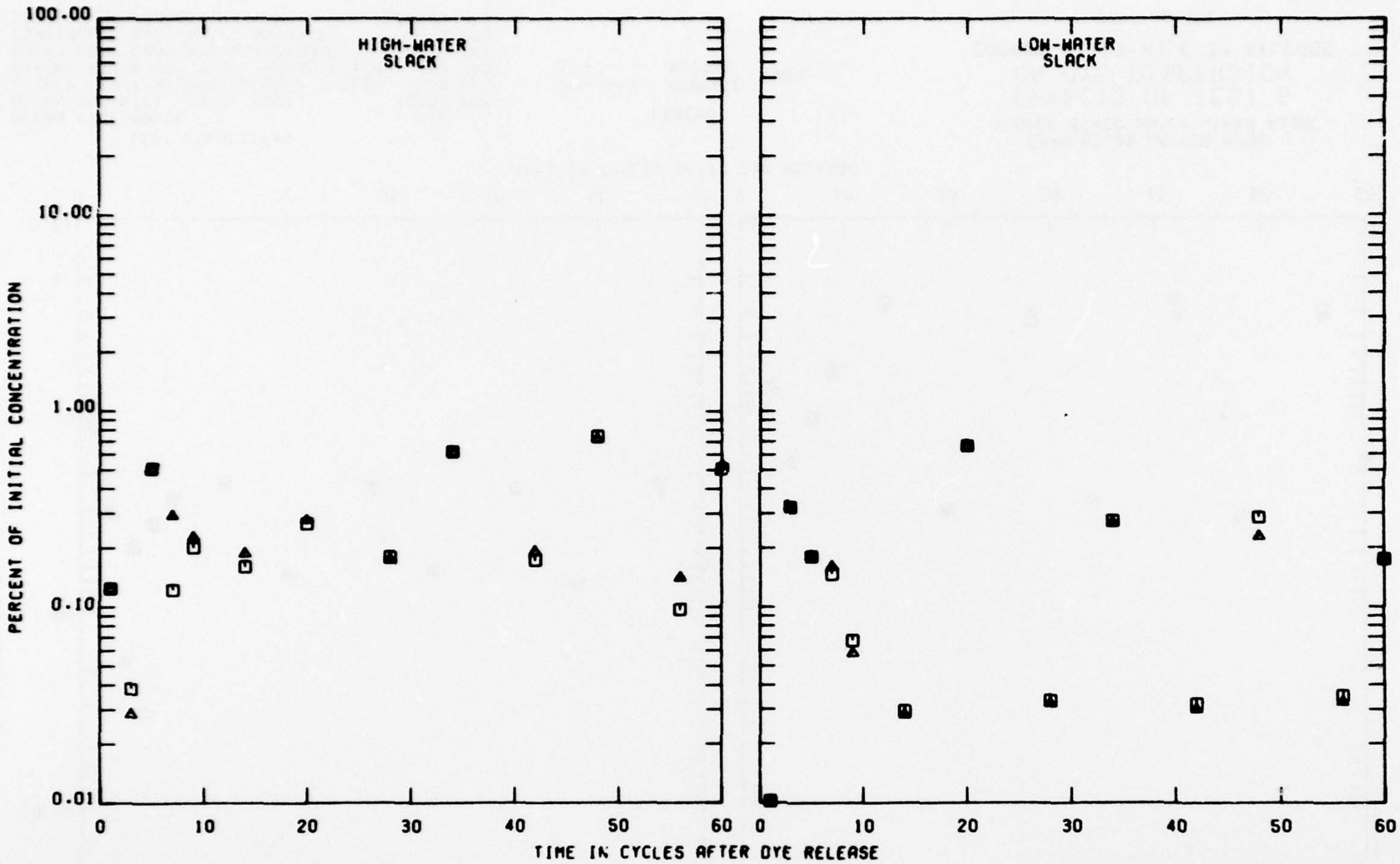
□ ——— SURFACE BASE
▲ — — — BOTTOM

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 6
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION 41C



TEST CONDITIONS

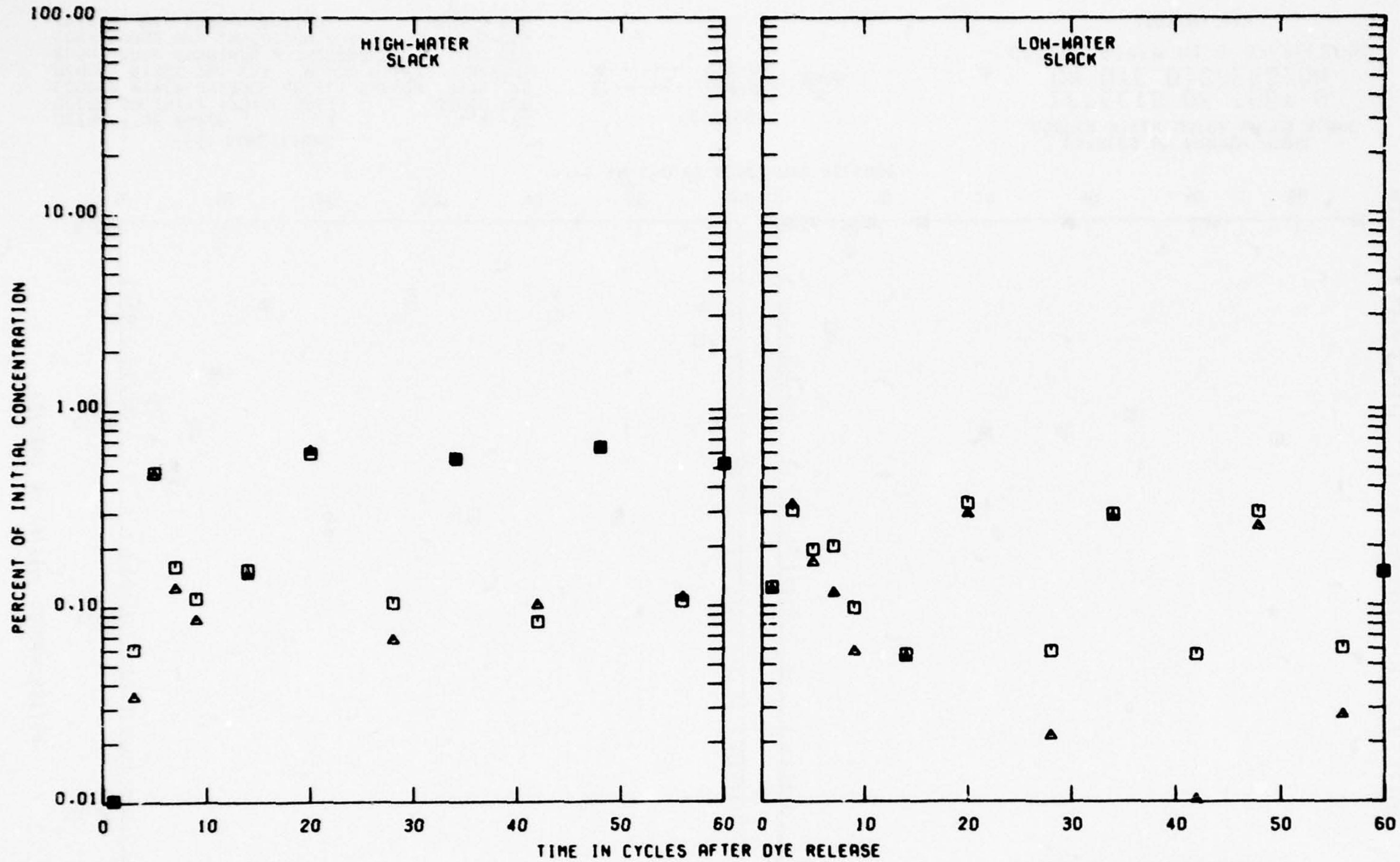
OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3500 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 6
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION 42C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3500	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
CONTINUOUS DYE INJECTION RATE	15	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

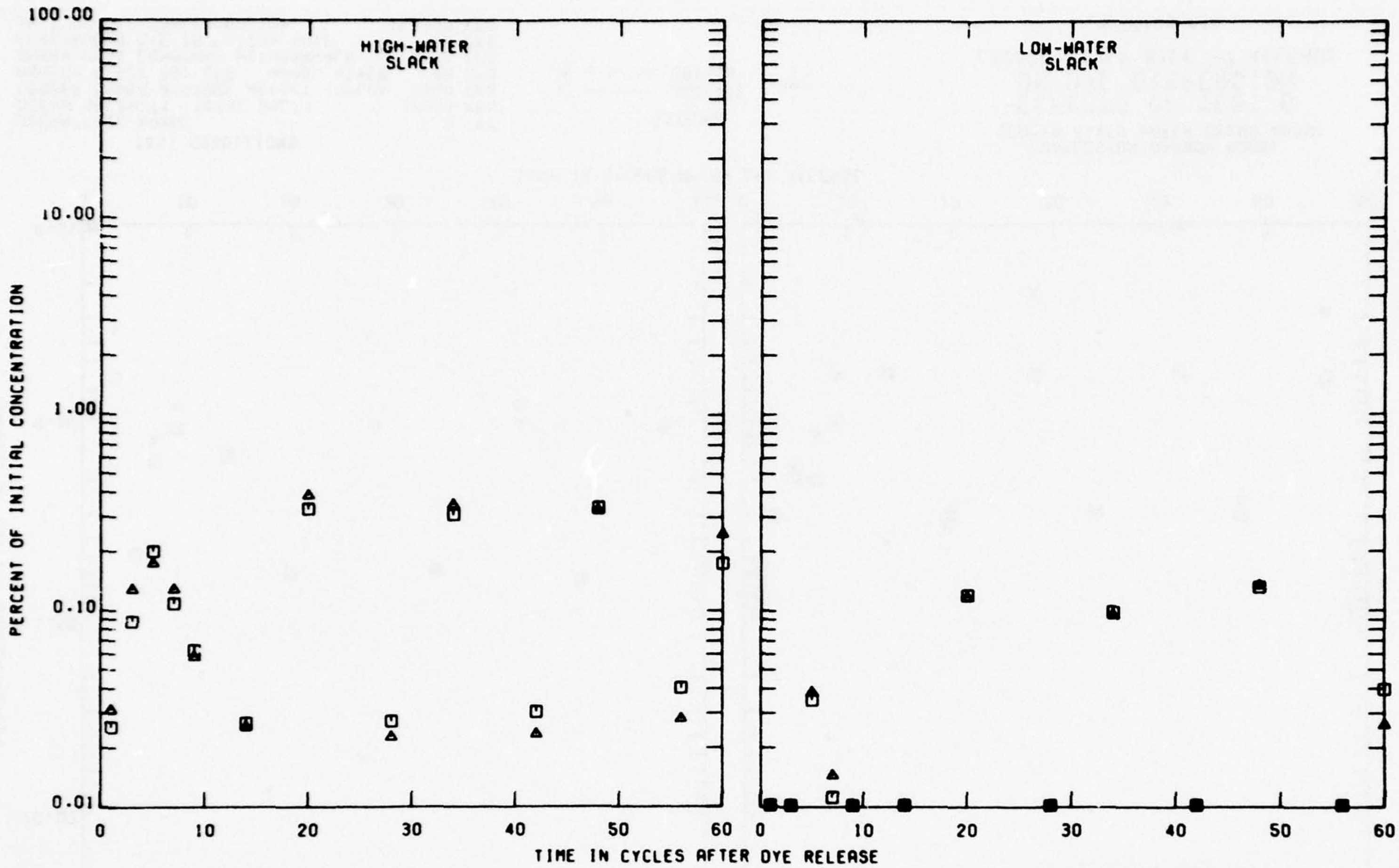
□ ——— SURFACE
△ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 6
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION 43C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3500	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
CONTINUOUS DYE INJECTION RATE	15	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

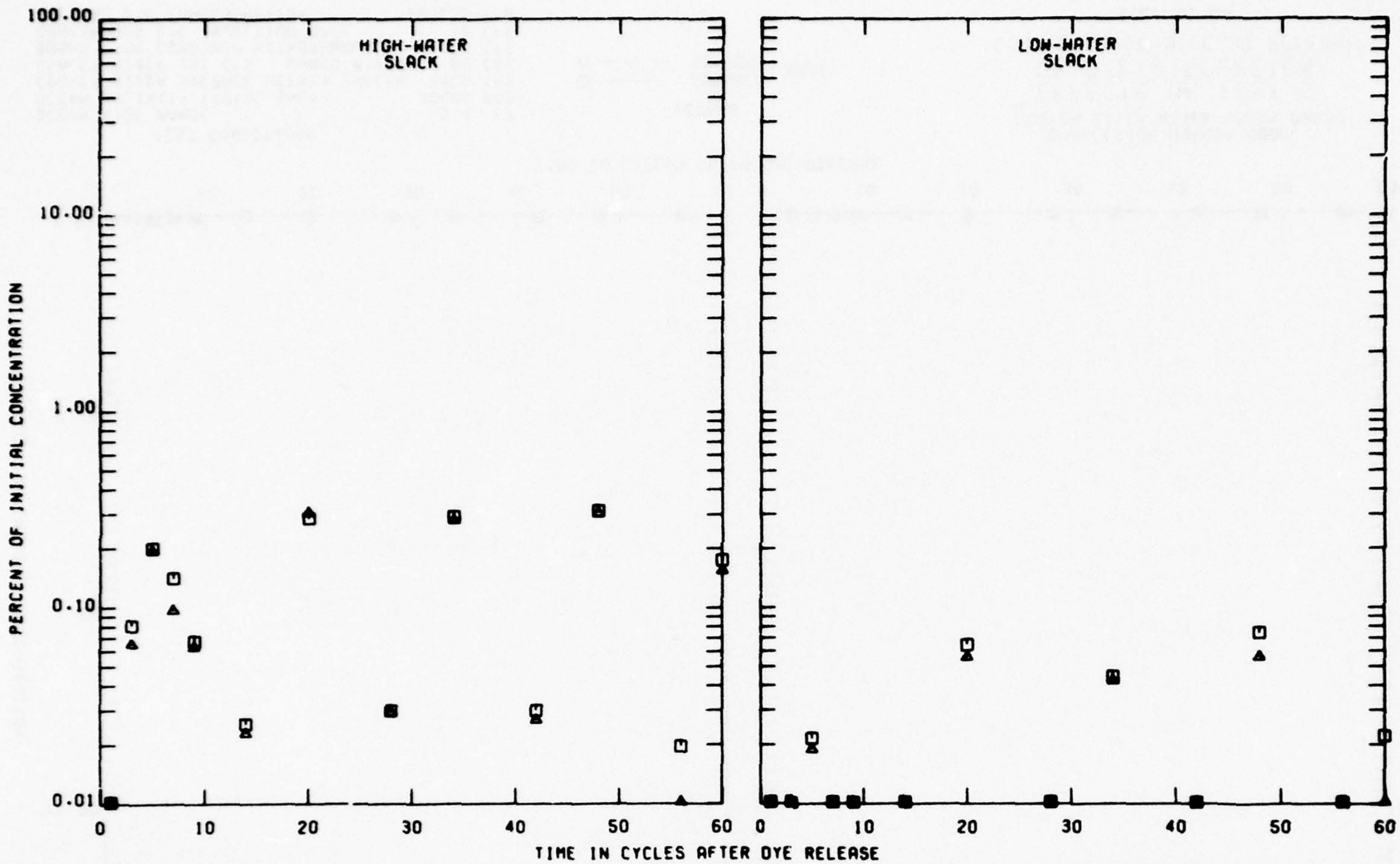
□ ——— SURFACE
▲ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 6
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION 44C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3500 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

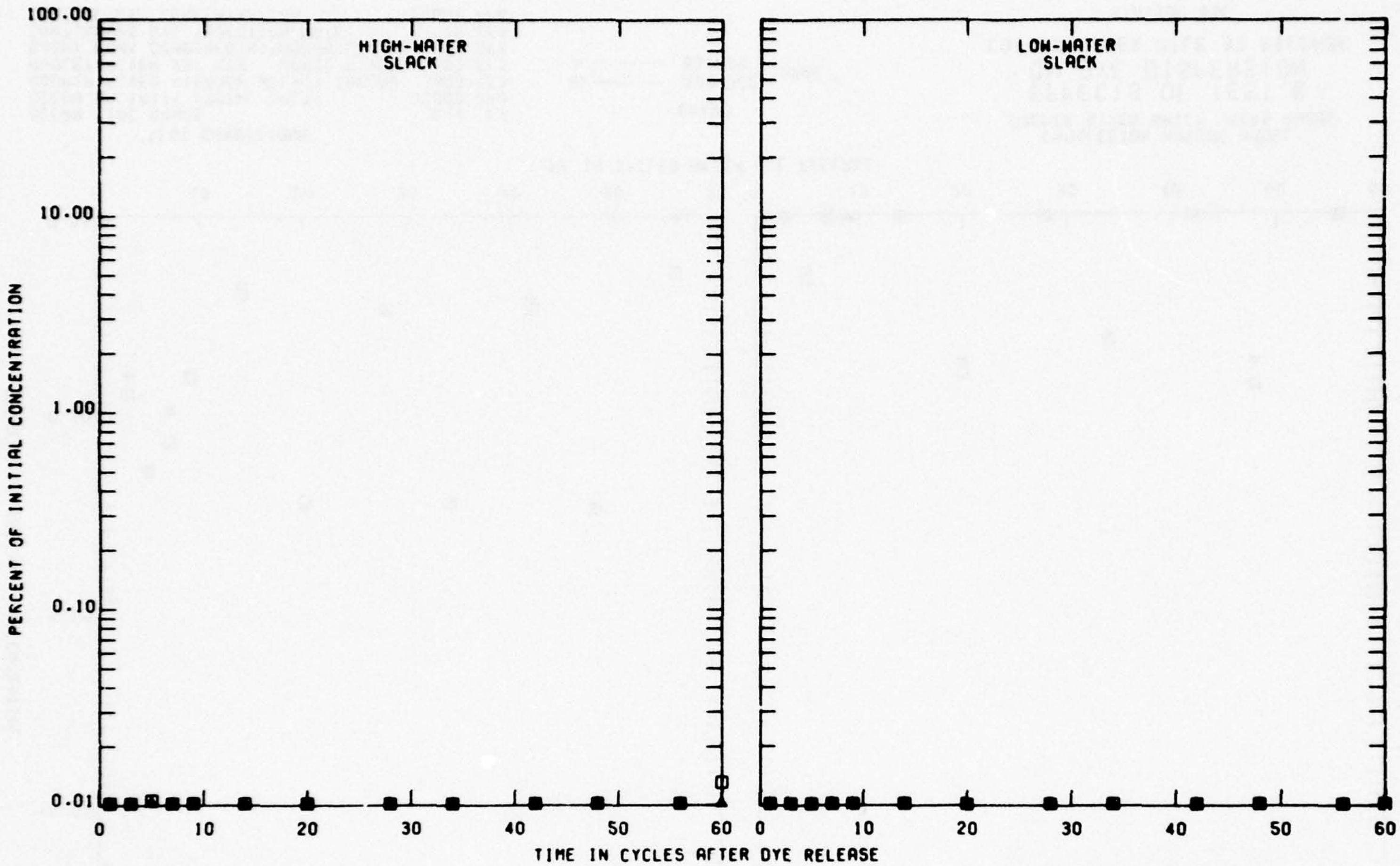
SURFACE
BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 6 ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION 45C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3500 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

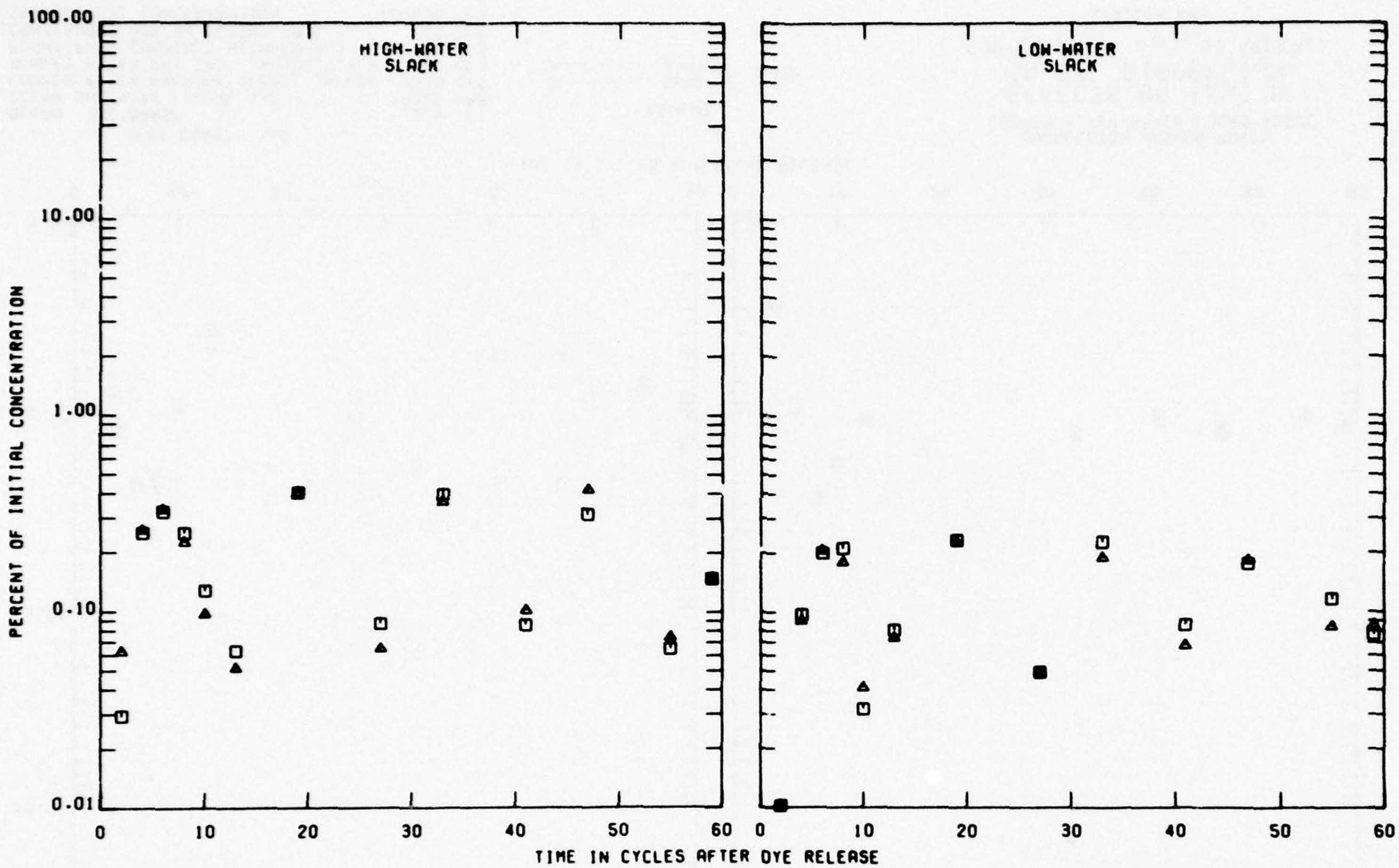
□ ——— SURFACE
△ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 6
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION 50C



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3500	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
CONTINUOUS DYE INJECTION RATE	15	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

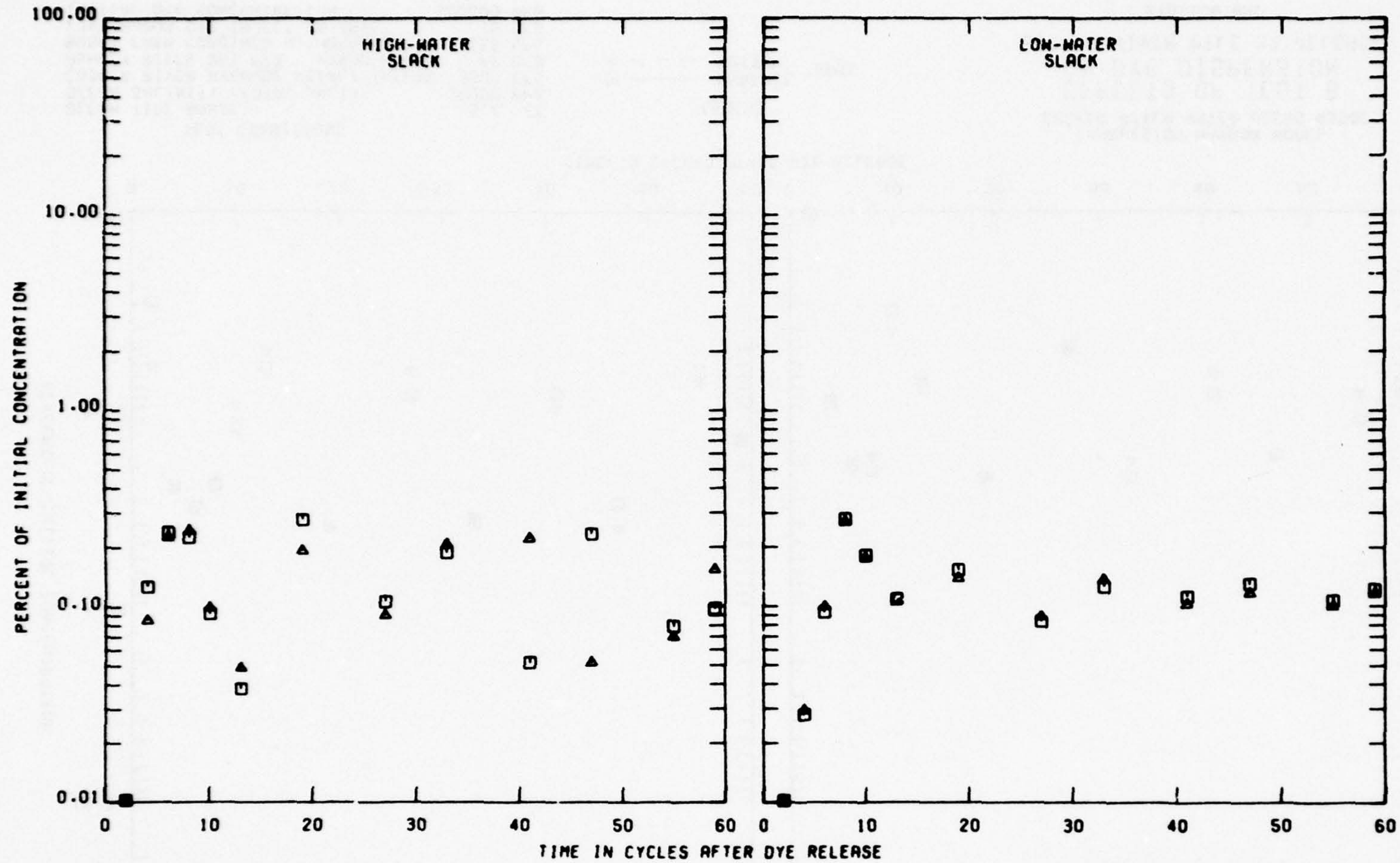
□ ——— SURFACE BASE
△ – – – BOTTOM

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 6
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION BRC



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3500 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

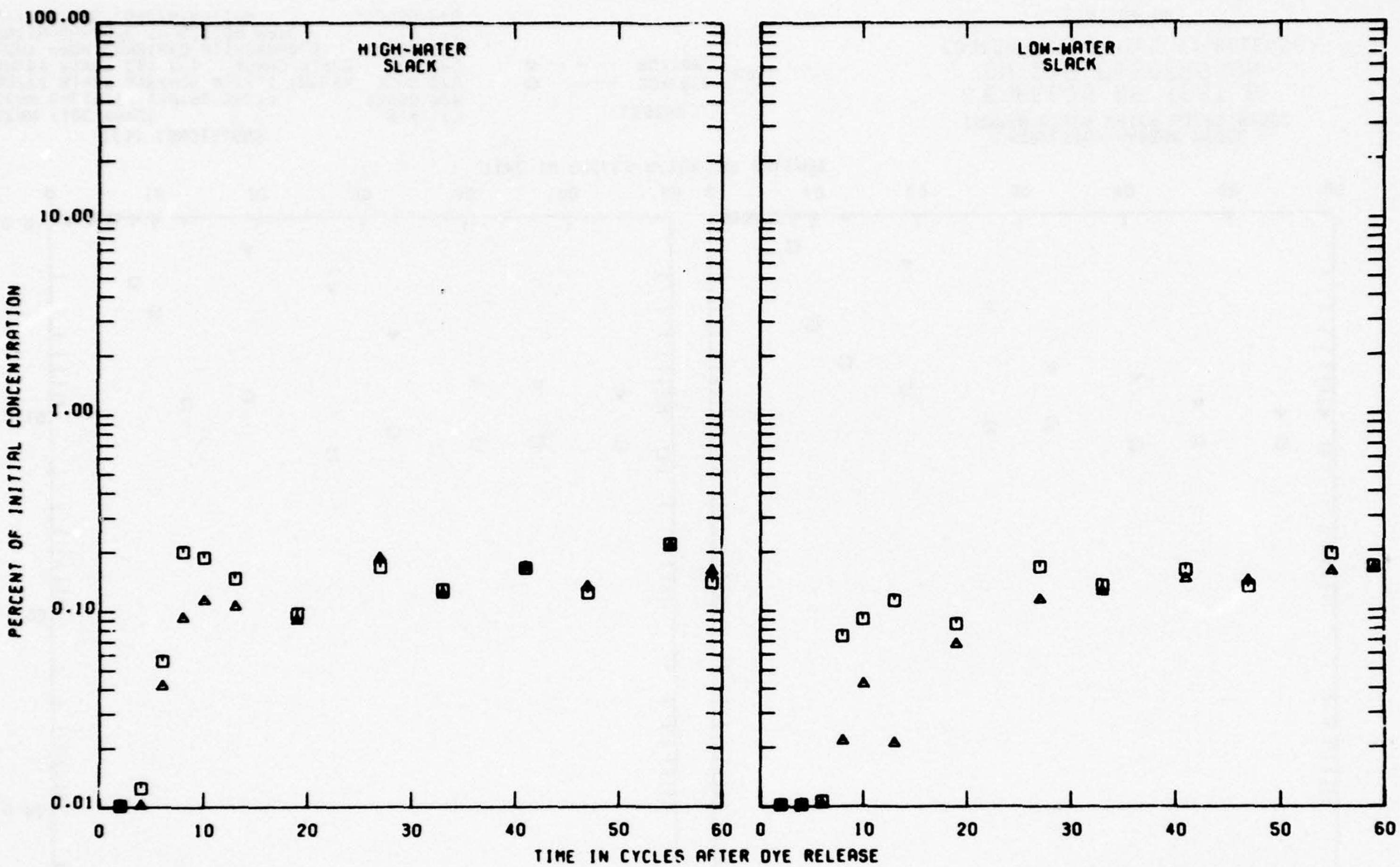
⊡ ——— SURFACE
▲ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 6
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION BR1



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3500	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
CONTINUOUS DYE INJECTION RATE	15	CFS
INITIAL DYE CONCENTRATION	100000	PPB

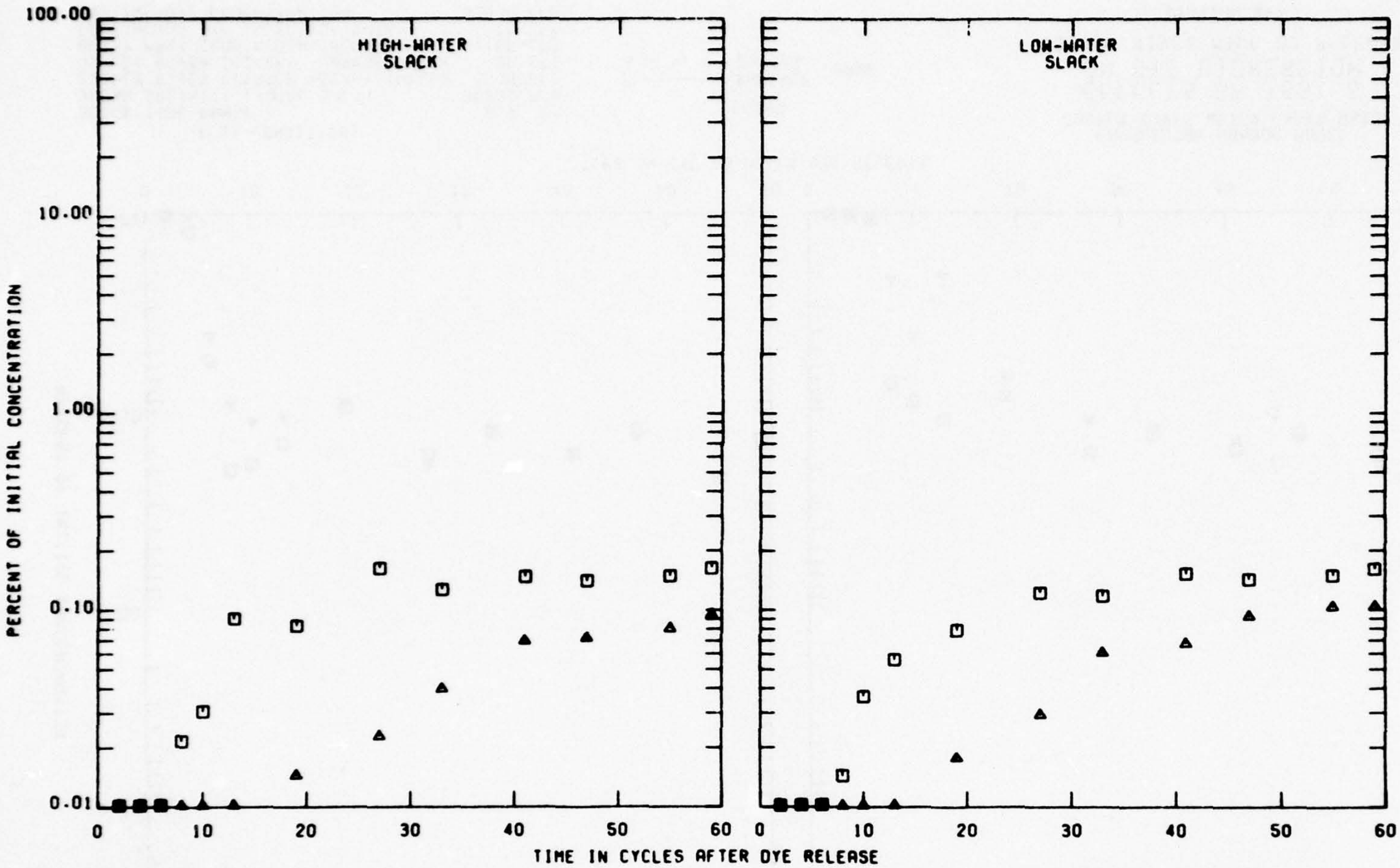
LEGEND

□ ——— SURFACE
▲ — — — BOTTOM
BASE

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 6
ON DYE DISPERSION
COOPER RIVER MILE 37 RELEASE

STATION BR2



TEST CONDITIONS

OCEAN TIDE RANGE	5.4	FT
OCEAN SALINITY (TOTAL SALT)	30000	PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3500	CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82	CFS
BUSHY PARK COMBINED WITHDRAWALS	1150	CFS
CONTINUOUS DYE INJECTION RATE	15	CFS
INITIAL DYE CONCENTRATION	100000	PPB

LEGEND

□ ——— SURFACE
△ – – – BOTTOM
BASE

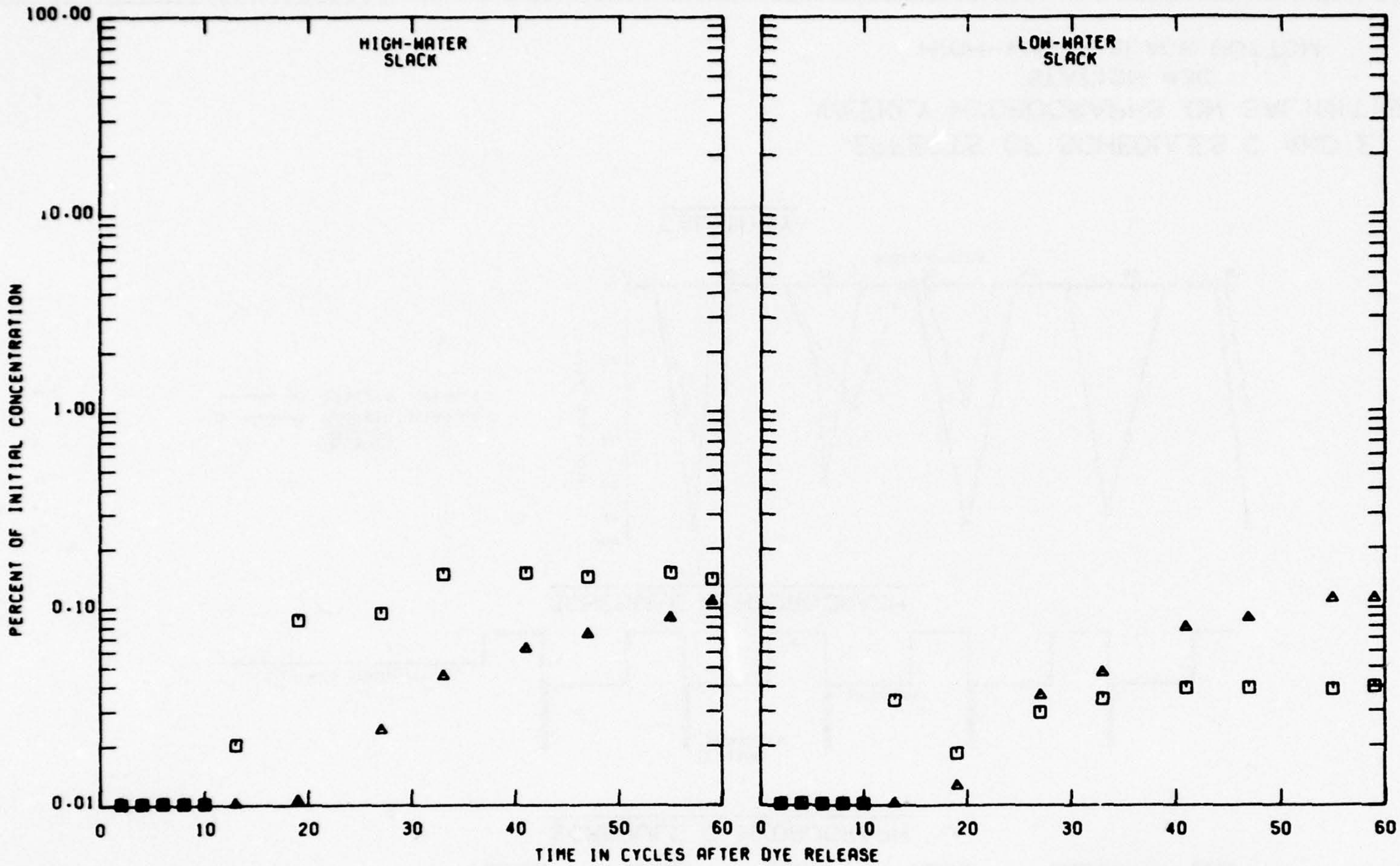
CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

EFFECTS OF TEST 6
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

STATION BR3

PLATE 114



TEST CONDITIONS

OCEAN TIDE RANGE	5.4 FT
OCEAN SALINITY (TOTAL SALT)	30000 PPM
COOPER RIVER AVERAGE WEEKLY INFLOW	3500 CFS
ASHLEY RIVER 261 CFS WANDO RIVER	82 CFS
BUSHY PARK COMBINED WITHDRAWALS	1150 CFS
CONTINUOUS DYE INJECTION RATE	15 CFS
INITIAL DYE CONCENTRATION	100000 PPB

LEGEND

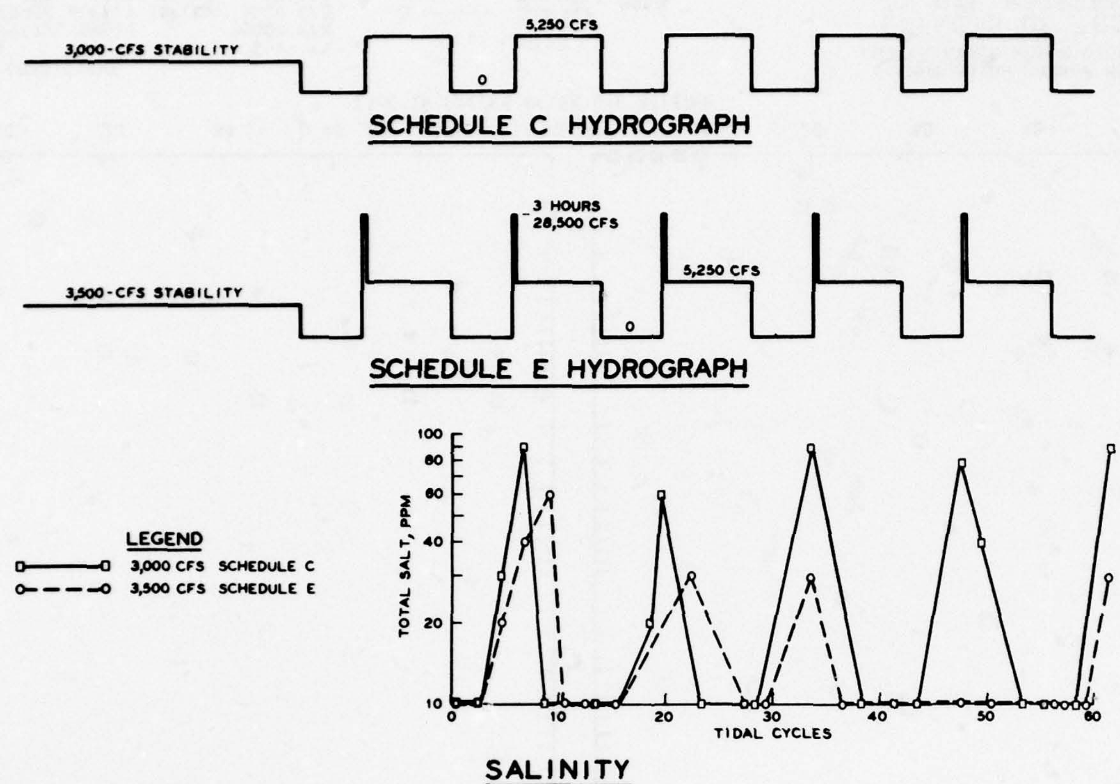
□ ——— SURFACE BASE
△ — — — BOTTOM

CHARLESTON HARBOR MODEL
COOPER RIVER WATER USERS ASSOC

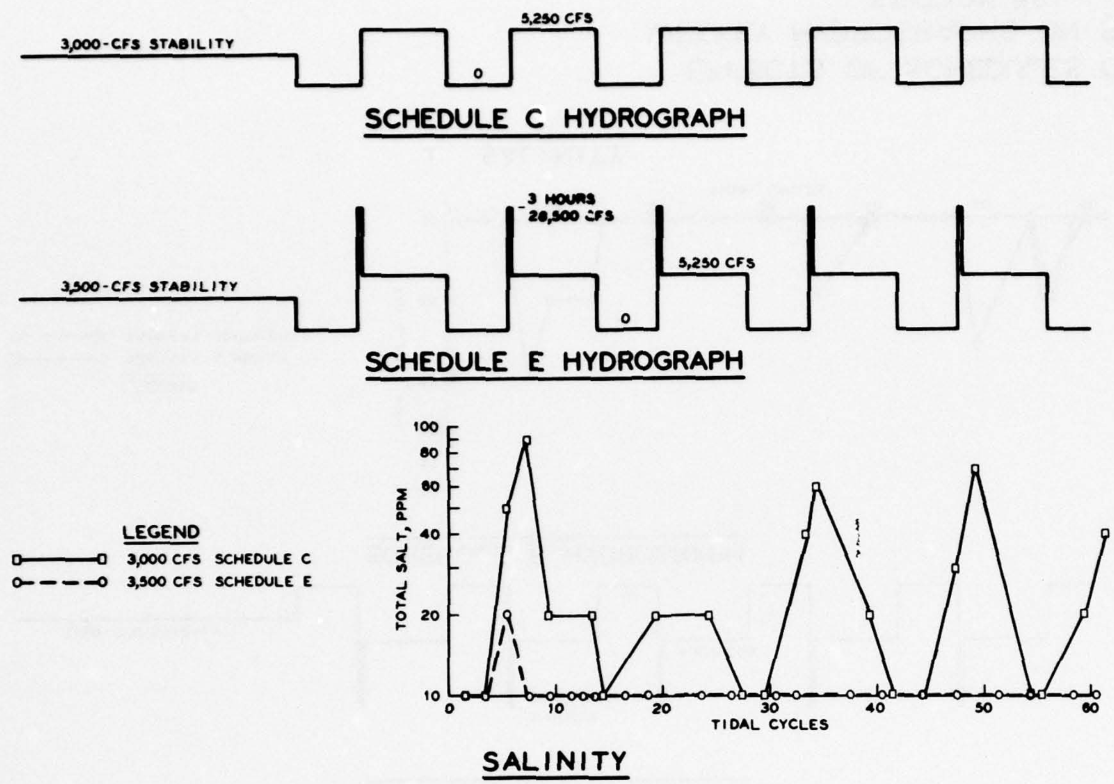
EFFECTS OF TEST 6
ON DYE DISPERSION

COOPER RIVER MILE 37 RELEASE

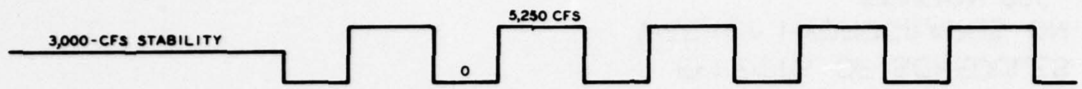
STATION BR4



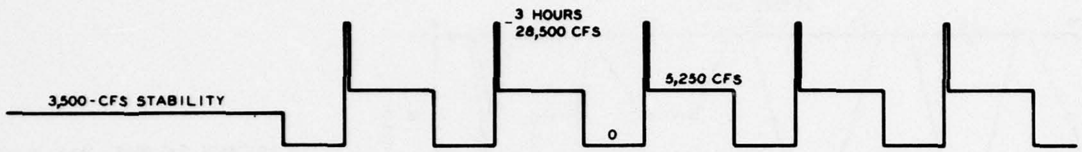
EFFECTS OF SCHEDULES C AND E
WEEKLY HYDROGRAPHS ON SALINITIES
STATION 43C
HIGH-WATER SLACK BOTTOM



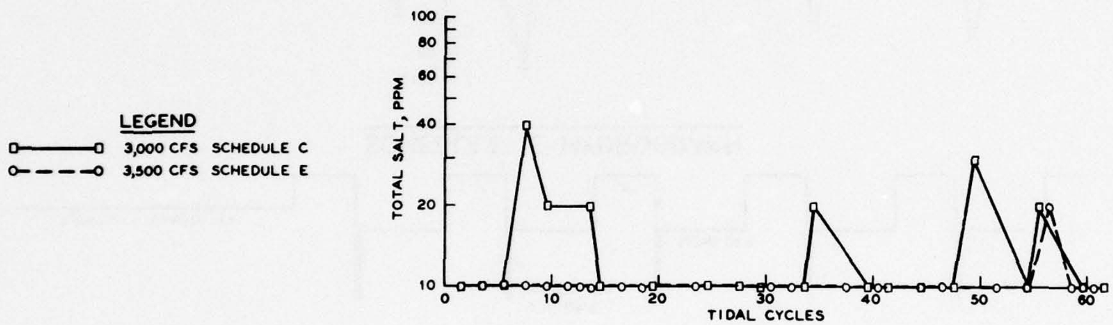
EFFECTS OF SCHEDULES C AND E
WEEKLY HYDROGRAPHS ON SALINITIES
STATION BRC
HIGH-WATER SLACK BOTTOM



SCHEDULE C HYDROGRAPH

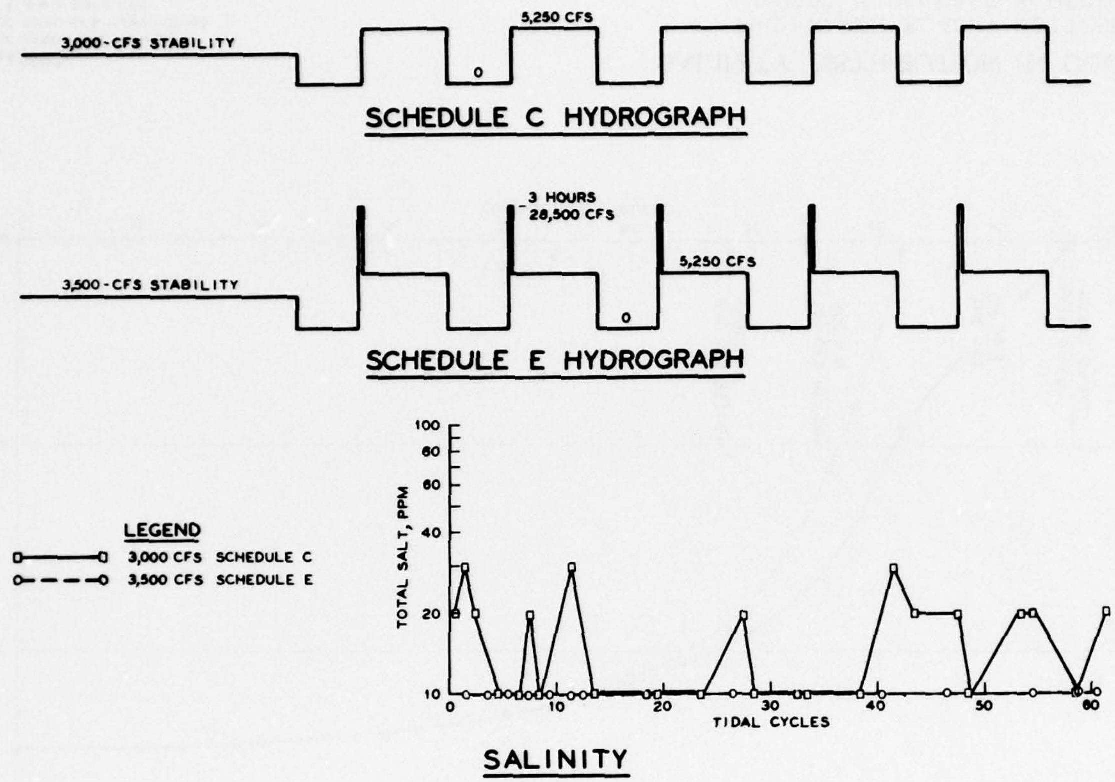


SCHEDULE E HYDROGRAPH

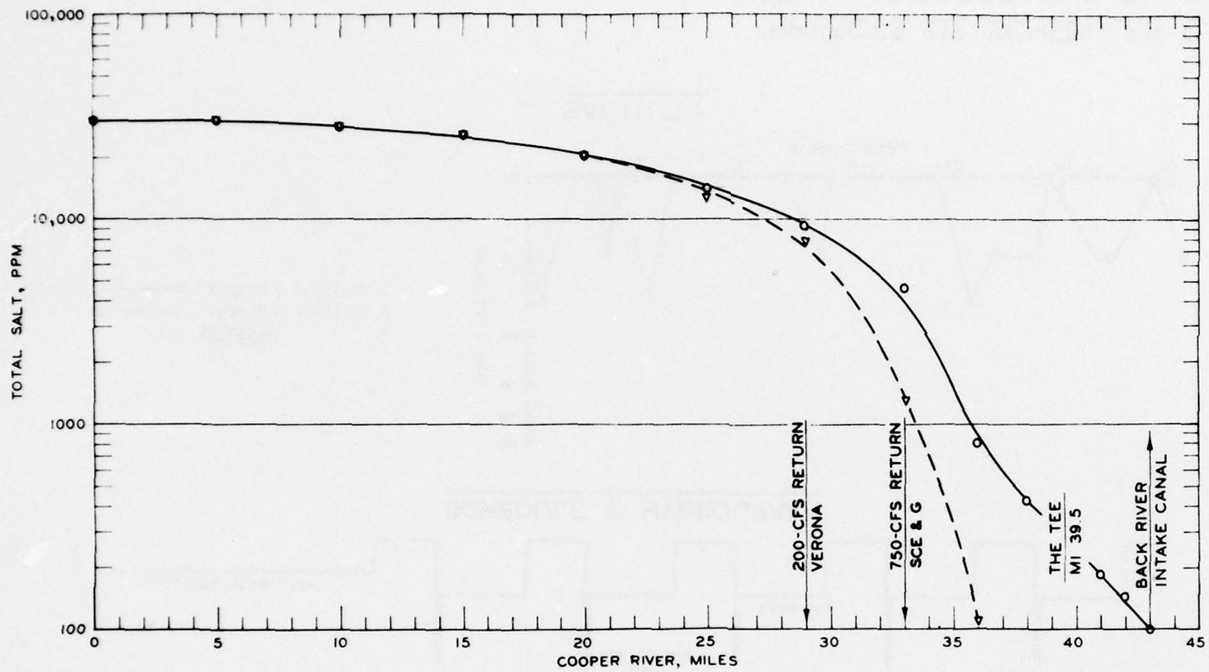


SALINITY

EFFECTS OF SCHEDULES C AND E
WEEKLY HYDROGRAPHS ON SALINITIES
STATION BR1
HIGH-WATER SLACK BOTTOM



EFFECTS OF SCHEDULES C AND E
WEEKLY HYDROGRAPHS ON SALINITIES
STATION BR2
HIGH-WATER SLACK BOTTOM



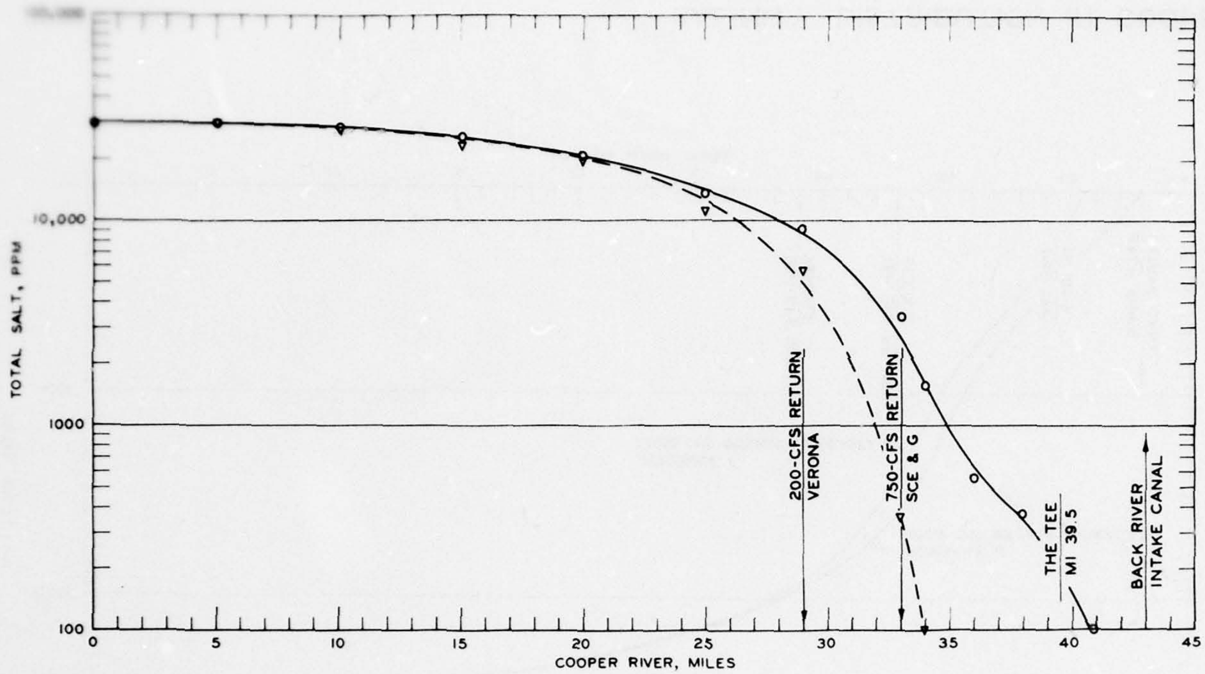
LEGEND

END OF ZERO-FLOW PERIOD
END OF 5250-CFS FLOW PERIOD
AVERAGE WEEKLY FLOW = 3000 CFS

NOTE: BACK RIVER WITHDRAWAL 1150 CFS

SALINITY DISTRIBUTION IN COOPER RIVER

HIGH-WATER SLACK – BOTTOM DEPTH
PINOPOLIS RELEASE SCHEDULE C
40-FT NAVIGATION CHANNEL



LEGEND

o——o END OF ZERO-FLOW PERIOD

▽— — —▽ END OF 5250-CFS FLOW PERIOD

AVERAGE WEEKLY FLOW = 3500 CFS

NOTE: BACK RIVER WITHDRAWAL 1150 CFS

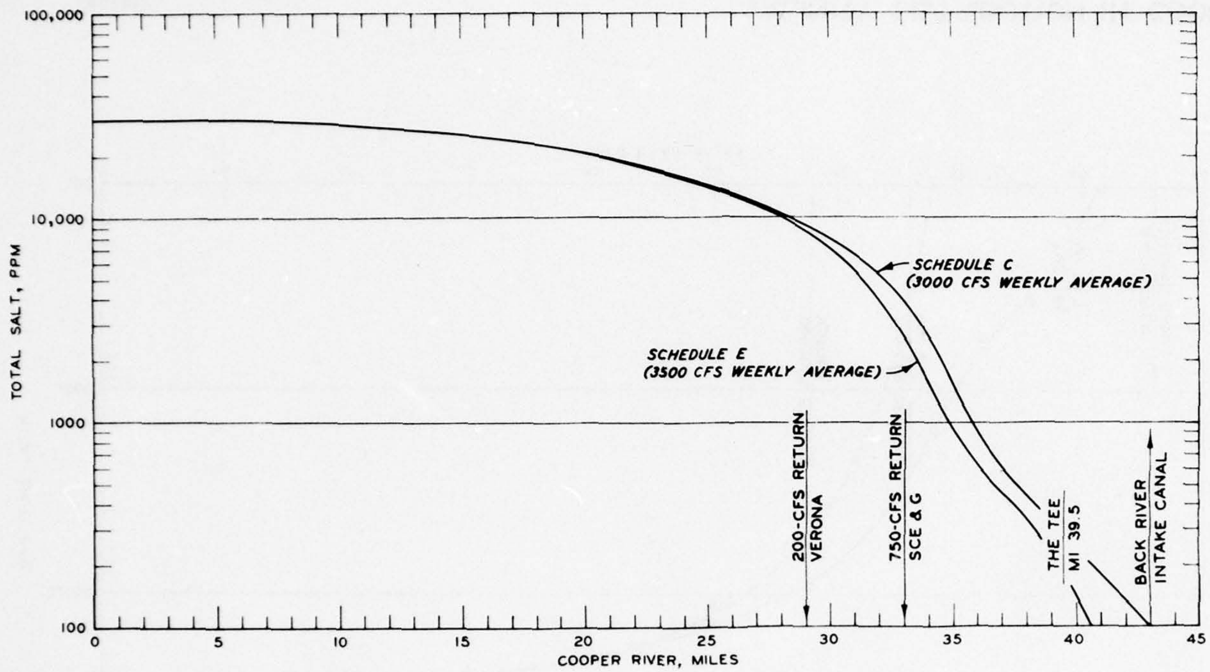
SALINITY DISTRIBUTION IN COOPER RIVER

HIGH-WATER SLACK – BOTTOM DEPTH

PINOPOLIS RELEASE SCHEDULE E

40-FT NAVIGATION CHANNEL

PLATE 121



NOTE: BACK RIVER WITHDRAWAL 1150 CFS

SALINITY DISTRIBUTION IN COOPER RIVER

COMPARISON OF SCHEDULE C AND SCHEDULE E
END OF ZERO-FLOW PERIODS
40-FT NAVIGATION CHANNEL

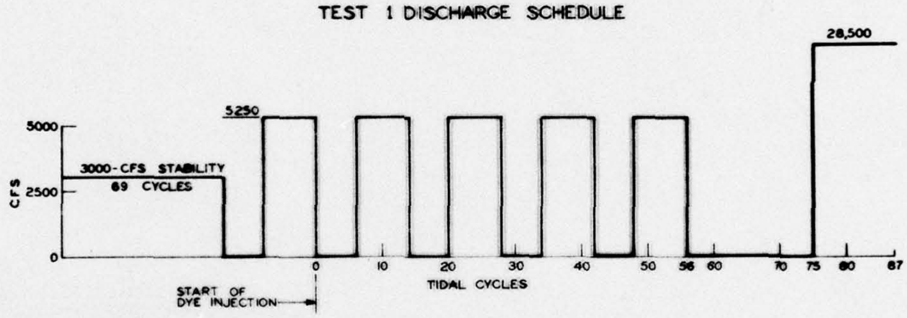
In accordance with letter from DAEN-RDC, DAEN-ASI dated 22 July 1977, Subject: Facsimile Catalog Cards for Laboratory Technical Publications, a facsimile catalog card in Library of Congress MARC format is reproduced below.

Benson, Howard A
Dispersion of proposed effluent discharges and saltwater intrusion in Cooper River; hydraulic model investigation / by Howard A. Benson, Robert A. Boland, Jr. Vicksburg, Miss. : U. S. Waterways Experiment Station ; Springfield, Va. : available from National Technical Information Service, 1977.
27, [28] p., 122 leaves of plates : ill. ; 27 cm. (Miscellaneous paper - U. S. Army Engineer Waterways Experiment Station ; H-77-14)
Prepared for State of South Carolina Water Resources Commission, Columbia, South Carolina.

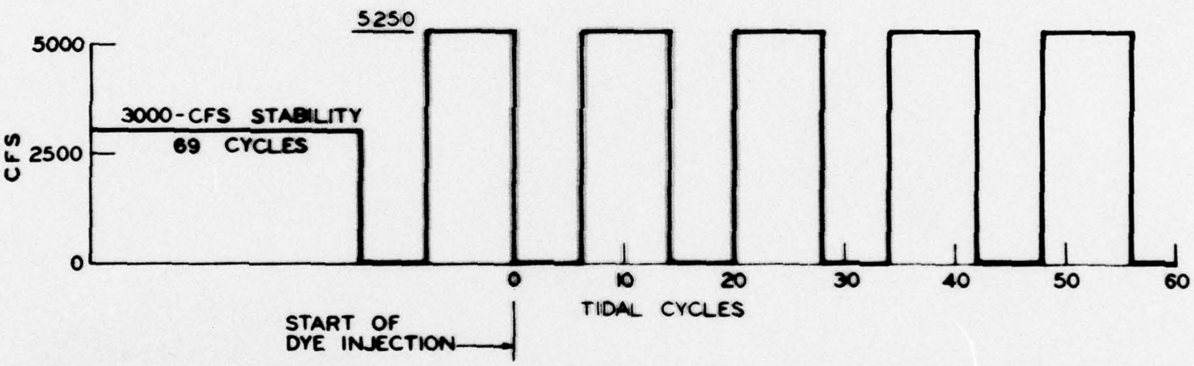
1. Cooper River. 2. Dispersion. 3. Dye dispersion. 4. Effluents. 5. Hydraulic models. 6. Salinity. 7. Saltwater intrusion. I. Boland, Robert A., joint author. II. South Carolina. Water Resources Commission. III. Series: United States. Waterways Experiment Station, Vicksburg, Miss. Miscellaneous paper ; H-77-14.
TA7.W34m no.H-77-14

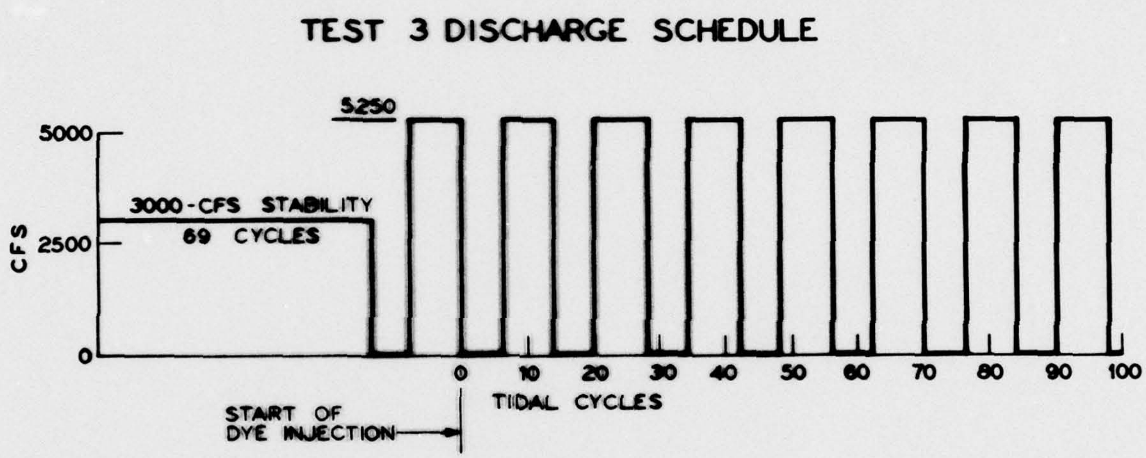
Contains:

TEST 1 DISCHARGE SCHEDULE



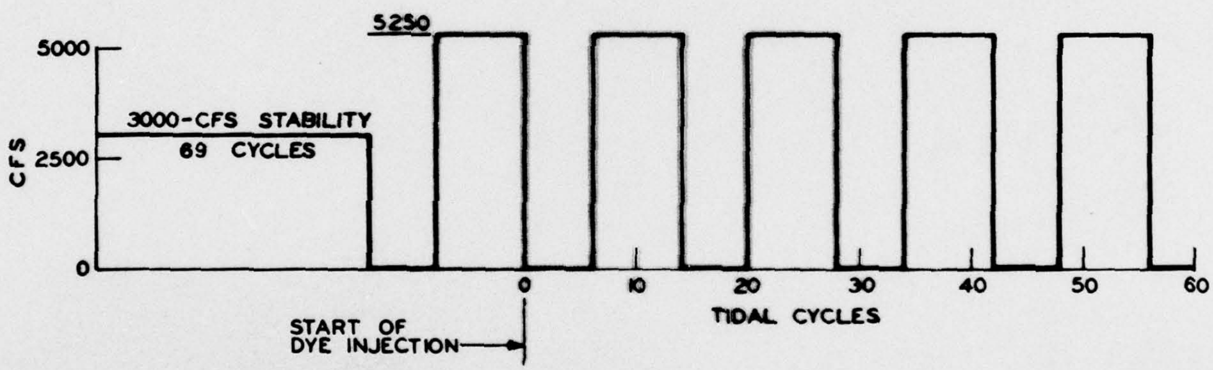
TEST 2 DISCHARGE SCHEDULE



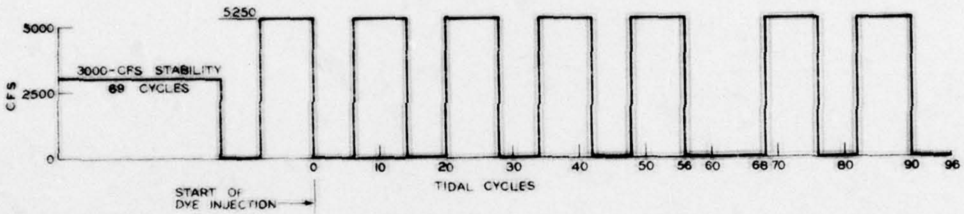


TEST 3 DISCHARGE SCHEDULE
5250
5000
3000-CFS STABILITY
69 CYCLES
CFS
2500
0
0
10
20
30
40
50
60
70
80
90
100
TIDAL CYCLES
START OF
DYE INJECTION

TEST 4 DISCHARGE SCHEDULE



TEST 5 DISCHARGE SCHEDULE



TEST 6 DISCHARGE SCHEDULE